BADGING TO SUPPORT TEACHING AND STUDENT ENGAGEMENT: AN IMPLEMENTATION OF A SCHOOL-BASED BADGING SYSTEM

by

Peter Samuelson Wardrip

BS, Latin Education, University of Wisconsin, 1997

MSc, Human Ecology, Centre for Human Ecology, 2004

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This dissertation was presented

by

Peter Samuelson Wardrip

It was defended on

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and approved by

Dr. Phillip Herman, Principal Researcher, McREL: Pacific Center

Dr. Chris Schunn, Professor, Learning Sciences and Policy

Dr. Louis M. Gomez, Professor, UCLA

Dissertation Advisor: Dr. Jennifer Lin Russell, Assistant Professor, Learning Sciences and Policy

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Peter Samuelson Wardrip, PhD

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Badges and badging have recently emerged as a program within formal and informal education to improve learning experiences. Yet, there are very few empirical studies of their implementation within a school setting. This dissertation presents two studies of a badging system within a school-based setting. As a school-based intervention, ostensibly the badging system could impact both the students and the teachers involved. Therefore, one of the studies directs its lens on the participating students and the other study directs its lens on the participating teachers. The first study explores the relationship between student participation in the school's badging system and students' interests. Specifically, the paper uncovers some key elements of the badges that motivated students' participation. The second study investigates the impact on teachers participating as facilitators within the badging system. Specifically, the study investigates if teachers learned new information about students that could be actionable for instruction, did the badging system influence their interactions with colleagues, and did the badging system influence their instruction in any way? The data suggest that the badging system provided teachers with new information about their students, but had minimal impact on the teachers' collegial interactions and instructional practice. The contribution of this work is more than simply providing empirical findings to a nascent field. These findings suggest design features to a badging system to support student motivation as well as ways that teachers can accrue benefits from involvement. Furthermore, this study offers hypotheses related to badging that can be pursued in future studies.

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1.0 INTRODUCTION

Badging has recently emerged as a program within formal and informal education to improve learning experiences. For example, Arne Duncan, U. S. Secretary of Education recently described the use of badges as a "game changing strategy." "Badges can help engage students in learning, and broaden the avenues for learners of all ages to acquire and demonstrate—as well as document and display—their skills" (MacArthur Foundation, 2011). Moreover, President Bill Clinton recently announced as part of his Clinton Global Initiative, a Commitment to Action to massively expand access to Open Badges to improve the futures of two million students and U.S. workers.[1] This initiative seeks to document and accredit skills from film editing to EMT training, learned within and outside of school settings, as a way to communicate students' credentials to colleges and employers.

These examples and others suggest that influential voices in policy are arguing for the use of badges within education and this is echoed by parallel funding initiatives by philanthropic foundations (see MacArthur and Gates Foundation's DML Competition). And while badges and badge-like symbols that represent such things as skills, achievements or social affiliation are not new (Halavais, 2011), these are new initiatives within the formal and informal education sphere.

This dissertation empirically explores an implementation of badges within a formal educational setting. Specifically, I present findings from two studies for this dissertation. In the

[1] See more at: http://www.macfound.org/press/press-releases/better-futures-2-million-americans-through-open-badges/#sthash.lpbJEKPG.dpuf

first study, I examine student participation in a badging system and highlight the relationship between certain aspects of the badges and the students' interests. This study addresses the general question: Why do students choose to participate in the badging program and specifically, in what ways does the badging system connect to students' interests. Students stated that certain elements of badges were salient to their involvement in earning the badges, such as the personal connection students could make to a badge, the recognition and reward they received through the badging process, the enjoyment and independence that the badging system provided for the students and the extent to which a badge aligned with the long-term values of the students.

In the second study, from the same school setting and in the second year of implementation, I will present findings from the teachers involved in the badging implementation. Specifically, this study addresses the questions: in what ways does participating in the badging system provide teachers with new information about students, in what ways does participating in the badging system facilitate joint work among the teachers, and in what ways does participating in the badging system impact the teachers' instructional practice? While the data suggests that participating in the badging system had less of an impact on teacher collegiality or instructional practice, the teachers discussed how the badging system created opportunities for them to learn new information about students, such as their interests, strengths outside of the school curriculum and challenges they face outside of school.

In the introductory chapter of the dissertation, I will review the background literature on badges in learning settings identifying what the field knows about badges in relation to learning outcomes. The presentation of badging literature is meant to situate this study within the current knowledge base of badging research and suggest where these two studies are contributing. In addition, I will note what the field of school improvement research has learned about bringing

innovations to schools. The most notable example of this might be project-based learning. Finally, I will describe the school site location and the methodological approach I used for these two studies. The second and third chapters are intended to be read as self-contained papers and, therefore, more methodological details are contained in those chapters.

2.0 BACKGROUND LITERATURE

These studies serve to provide empirical findings to a field with few findings currently available. Nevertheless, to introduce these two studies, it is worth setting them within the current context of badge research and writing. To do this, I will address three questions.

What do we mean by "badges" or "badging?" While the analogy of the boy and girl scouts or achievements from video games are important referents to communicate what badges are, it is also necessary to highlight the characteristics around which most researchers and designers define badges.

What functions do researchers and designers believe badges perform? Badges can serve various functions or, put a different way, solve various problems that exist in formal and informal learning environments. While the two studies presented in the dissertation do not address all of the functions that badges address, it is worth considering the variety of purposes badges serve in general to understand the particular findings of the studies.

What do we know about badges from empirical studies? As of this writing, there are very few published reports of empirical studies on badges. The two studies I will present here make early contributions to the field as a whole and, taken with other studies, can help refine the assumptions about badging that advocates promote. As I will discuss later, these studies in particular can serve to generate hypotheses and craft design interventions to further investigate badges within learning settings.

2.1 WHAT ARE BADGES?

Badges have a long history of documenting accomplishments (Halavais, 2011). A current prominent way of defining badges as proposed by the Mozilla Foundation is "… a symbol or indicator of an accomplishment, skill, quality or interest" (Open Badges White Paper, 2011). In general, badges are public representations of what one has learned, accomplished and experienced (Plori et al, 2007). In this way, badges are visible to others. While much of the literature on badges characterizes them as digital or inhabiting digital spaces, badges can be both digital and tangible (Halavais, 2011). In fact, the most common referents for badges in communicating what they are is the tangible, merit badges that are rewarded to scouts of the Scout Association,[2] the Boy Scouts of America[3] and the Girl Scouts of America.[4] In turn, the scouts have been influenced by the use of medals within the various branches of the military.

Another perspective on the meaning of badges comes from Montola and colleagues (2009). In their brief study of implementing achievements with a photo sharing web application, they define achievements as " …secondary reward systems that have been developed for digital games" (2009; p. 94). These rewards represent deeper levels of engagement and experience as more badges are earned (De Paoli, De Uffici, & D'Andrea, 2012). In this way, they are viewed as optional reward structures that can scaffold a user's direction through a game.

The work of Montola and others situates badges as an example of gamification. In this way, badges are sometimes considered a game mechanic and some game designers view badges as an example of gamification (Zichermann & Cunningham, 2011; Deterding et al, 2011).

[2] http://scouts.org.uk/what-we-do/badges-and-awards/
[3] http://www.scouting.org/meritbadges.aspx
[4] http://www.girlscouts.org/program/basics/for_volunteers/where_to_place/junior

Gamification is defined as the use of game mechanics and other elements of game design that are used or designed in non-game situations (McGonigal, 2011). Game mechanics therefore shape participants' experiences in games. Taken within this context, badges would be thought of a way to shape the way a learner engages with a task.

Ultimately, badges provide a tangible or digital representation of what a badge earner has done. Within the context of this study, I will investigate tangible badges that are awarded within a school setting. However, the research that has investigated badges up until now has often taken place within an online environment. In the next section, I will highlight this research that situates these studies within a larger context.

2.2 WHAT ARE THE FUNCTIONS OF BADGES?

Advocates for badges generally tout a variety of functions that badges can serve for learners and/or within a learning environment. The relative advantage of badges is that they may provide a more detailed view of what the badge recipient has learned when compared to traditional diplomas and can signify learning in informal environments (Selingo, 2012). This has been referred to as transparency in credentials (Goligoski, 2012). Antin and Churchill (2011) identified five functions of badges. These functions are: *goal setting*, *instruction*, *reputation*, *group identification* and *status/affirmation*.

Goal setting for badges refers to mileposts that can be set for learners or participants as they proceed. This is perhaps an intuitive aspect of badges, but goals have been highlighted as motivating and consequential within a learning activity (Elliott, 1999; Belenky & Nokes-Malach, 2012). Sometimes referred to as achievement goal theory within a learning activity, goals can

influence a learner's engagement in an activity by the extent to which they seek to perform or master a skill or, on the contrary, the extent to which they avoid performing or demonstrate underperformance. Additionally, goals have been noted as design features of computer-based learning environments that assume that people learn through participating in activities that help them reach their desired goals (Schank, 1994; Schank et al, 1994).

Instruction for badges refers to the ways that badges can offer guidance to users or learners for what is valued within a particular setting. In game design, Zimmerman (2004) refers to badges as an example of "operational rules," or "completion logic," in that the badge or achievement describes what the player must accomplish within a game. For example, Montola and colleagues (2009) used badges, or achievements as they are often called in games, to show participants the potential features of a photo-sharing system.

Similarly, as badges can point participants to different aspects of a learning, work, or gaming activity, they may also highlight and affirm different roles that the participants can fulfill within the system. For instance, a content analysis of barnstars in Wikipedia has revealed that the work carried out in Wikipedia can go beyond simply editing and includes such tasks as social support and administrative tasks (Kriplean, Beschastnikh & McDonald, 2008). These barnstars, similar to badges, are tokens of appreciation provided to participants for different actions[5]. In both of these cases, the badges instruct the users what is valued within the activity that allocates the badges.

Reputation for badges refers to the ways in which badges can embody badge earners' interests, experiences and skills. In the case of the Boy Scouts, the badges serve as not only a

[5] For a listing of Wikipedia Barnstars, this URL provides a list and description: http://en.wikipedia.org/wiki/Wikipedia:Barnstars.

public symbol of what a scout has experienced, (e.g. camping badge or wilderness survival badge), but also potentially the badge earner's level of expertise, (e.g. the number of badges related to outdoor skills), or even the badge earner's level of engagement in Boy Scout-related activity, (e.g. through the number of badges that the badge earner has earned). Within game settings, the extent to which a player arrays their achievements has been described as enabling the player to accrue extra-game rewards. This has been documented from the game Team Fortress 2, in that players display belongings and weapons through increased performance and experience (Bjork & Holopainen, 2005, Moore, 2011).

Status/Affirmation refers to the value that is attributed to one's badges by both the badge earner as well as by the others participating in the community that uses the badges. Greater status can be given to a badge earner that has earned a higher number of badges or who has earned especially difficult to earn badges (Antin & Churchill, 2011). Moreover, the accumulation of badges can serve as positive affirmation of one's previous experiences and effort. This has been likened to having a collection of trophies that serve as a reminder of past accomplishments (Antin & Churchill, 2011).

It should be noted that those writing about badges have also merged the notion of status, affirmation and reputation into the idea of recognition. The idea is that badges serve as recognition for prior accomplishments. This recognition can serve the badge earner as currency as in a process of credentialing (Mozilla White Paper, 2011). This is especially useful in the recognition of micro-skills that are not often captured by more "blunt" forms of credentials such as educational degrees, transcripts or certificate programs. One example of this is the web site,

Stackoverflow. Stackoverflow[6] offers questions and answers for computer programmers, both professional and enthusiasts. Users develop a reputation score based on their participation on the site and as they develop their score, they accrue badges based on such elements of participation such as questioning, answering and moderating.

Badges as symbols to publically recognize skills have been advocated as important to their design for learning environments since they can not only recognize micro-skills that are not visible from more traditional forms of credentialing, but also skills that may not be valued by formal educational providers (Gibson et al, 2013). Important to this notion is that not only can a person be certified for having acquired knowledge or skills outside as well as within formal educational institutions, but also that the awarding of the certificate has credibility with both educational institutions and employers (Hickey et al, 2013).

Group Identification refers to the ways in which badges serve as constituent elements of a particular community. In the case of the boy scouts, earning badges is an integral element of participation within boy scouts' troops and the badges are recognizable to both in-group members as well as those outside of the group. Moreover, earning badges can create a sense of solidarity among a group and provide a common experience for all members in the community (Antin & Churchill, 2011). This has been true both for those who seek out badges as well as those who reject the notion of badges. For example, early research on active badges—computational badges that support distributed computing systems—suggested that acceptance or

[6] The web site can be found at: stackoverflow.com. An explanation of the badges for the site can be found at: http://stackoverflow.com/help/badges. The career site on stackoverflow is by invite only and user profiles (e.g. reputation score and badges) serve as at least two criteria for gaining access to their career site.

rejection of badges divided workplaces into two communities that were linked to members' beliefs about collaboration and privacy (Harper, 1996).

It is worth pointing out that the extent to which badges or achievements are required or optional activities within a game or learning environment is contentious. Hamari & Eranti (2011) have pointed out the important of badges to provide an optional layer within a game rather than a mandated layer. While this may not be relevant for the two questions investigated in this study, I will return to this notion in the discussion chapter at the end of this dissertation as this has implications for how badging systems may be designed within a formal environment.

While these functions often view badges as an incentive within a particular activity, (i.e. a badge is to be earned and therefore a participant will engage in the badge-related activity in order to earn a badge), it is important to underscore that these functions show that a badge has different functions based on who is viewing the badge. Part of what is important to carrying out research related to badging—especially within learning environments—is to understand what a badge is signaling or can potentially signal to different audiences; often simultaneously. In other words, a computer-programming badge may recognize a badge earner's competency in writing code to viewers of the badge as well as send the message that the badge earner is a member of a computer programming community.

2.3 WHAT DO WE KNOW ABOUT BADGES?

The early stage of research on badges has been noted by researchers and advocates of badges alike (Abramovich, Schunn & Higashi, 2013; Riscoscente, Kamarainen & Honey, 2013). Much of the discourse related to badging for learning in the past three years has taken a stance

suggesting that badging would be a useful component to integrate into learning designs rather than reporting empirical findings (e.g. Alberts, 2010; Barker, 2013). However, there is some research that has been done on badges, which sets the stage for additional research. This research can fit into two loose categories: research on the link between badge earners' motivation and engagement and research on the link between badge earning and learning.

2.3.1 Badges and motivation

Most of the extent research that has been carried out has sought to address a relationship between badge earning and user motivation or engagement. For example, an early instantiation of merit badges that were integrated into a digital learning environment occurred in MOOSE Crossing (Bruckman et al, 2000; Bruckman, 2004). MOOSE Crossing was an online learning community designed in the mid 1990s to embody constructionist learning principles. As the activities and platform for the learning community were refined in its designs over time, merit badges were incorporated. These merit badges, inspired by the Boy and Girl Scouts, could be earned for programming and writing within the online community. Based on interview data, their findings suggested that badges—a redesigned component of the online learning system—revived participants' interest in MOOSE Crossing and offered promise for teachers' use for assessment. Unfortunately, these findings were a secondary point within the articles, and therefore not systematically described, since the articles served to provide a broader description of the MOOSE Crossing system.

In studying user motivation of an online intelligent tutoring system, Abramovich, Schunn and Higashi (2013) have produced the most informative study to data. In their study, they investigated badges within an intelligent-tutor system for teaching applied mathematics to

middle school students. Their findings indicate that badge earning could be driven by learner motivations and that systems with badges could have a positive effect on learner motivations. However, their data suggest that badge-earning patterns of users were different across learners with different levels of prior knowledge. They also concluded that different badge types, that is badges that are awarded for different kinds of skills and experiences, also affected different learners' motivation. What is important about this study is that it problematizes the taken-for-granted notion of badges being motivating as it questions the ways that badges can be motivating and for whom.

Stackoverflow has provided a context for emerging research on badges. Two studies have looked at the relationship between user participation on Stackoverflow before earning a badge and after earning a particular badge (Oktay, Taylor & Jensen, 2010; Anderson et al, 2013). By looking at specific badges on Stackoverflow and tracking the mean daily participation of badge earners 30 days before and after earning the badge, user participation significantly decreased after earning the badge. These studies suggest that earning a badge motivated the user engagement on the site.

2.3.2 Badges and learning

Similar to the research reported above, there is a paucity of studies that connect badges with learning. However, there are a few studies that are worth noting that seek to make a connection between badging and learning. For example, in a recent study of an online learning environment for higher education students, Hakulinen and colleagues (2013) explored the role badges can have on students' learning behaviors. Specifically, they explored whether using badges in the design of their learning environment could influence and encourage learners toward positive

learning behaviors such as carefulness and time management. Using an experimental design, they compared a group of students that participated in an online learning environment that included badges and a group of students that participated in the same online learning environment without badges. Their analysis suggested that some behaviors could be influenced by badges, such as carefulness and time-management, but these impacts decreased over time and were influenced by the university student's major.

Since content standards represent the important content goals for a specific discipline, one study addressed the extent to which Boy Scouts' merit badges map onto standards. Specifically, Hintz (2009) examined the overlap between the badges awarded by the Boy Scouts of America and the National Science Education Standards. She found that 85% of the merit badge requirements included at least one requirement to earn the badge that met a science standard.

In addition to specific content found in standards, the cognitive processes that are demanded by specific activities can also relate to learning benefits of an activity. This is the reasoning used to support another comparison study involving merit badges. Vick and Garvey (2008) attempted to connect the objectives of science related merit badges in the Boys Scouts and cognitive processes as defined by a revised Bloom's taxonomy. Through a content analysis of the badging requirements for a selection of science-related badges, their findings suggest that current badging objectives and requirements often neglect to encourage students to engage in deeper-level cognitive activities such as evaluating and creating.

One study has investigated the extent to which badge earning relates to learning within a content area. Hintz and Thomson (2012) investigated the relationship between the earning of a particular badge and performance on a test assessing content connected to the badge. They found

that students who earned geology related badges through their Boy Scouts experiences had significant gains in geology knowledge. They measured these gains based on student performance on pre and post-test geology assessments. (Hintz & Thomson, 2012).

It is worth pointing out that, to date, I have not been able to find studies of badges or badging systems from the perspective of teachers being users or facilitators of learning. Khaddage et al (2012) made an argument for badges to support K-12 teachers' skills and achievements. While speculative, their paper argued that potential benefits of badges, specifically for validating teachers' skills with mobile technologies and encouraging participation in professional development based on the recognition that the teachers would achieve from the badges.

To summarize these findings, there are some important points to make. First, the early research suggests that there is some relationship between badge earning and motivation or engagement. However, not surprisingly the findings do not represent a conclusive evidence base to suggest what this means. As Abramovich and colleagues begin to highlight, there are mitigating variables that are involved when one seeks to draw a relationship between badges and motivation; for example, a badge earner's prior knowledge or whether he or she is motivated by mastering a skill.

Similarly, the connection between earning badges and learning also represents findings at a very early stage of research. The previously mentioned studies draw a connection between badging requirements and standards of content and cognitive activity. While it is reasonable to investigate the overlap or alignment between badge-earning requirements and standards, it represents a high inference for the learning of the badge earner. A similar claim can be made

about the study of geology badge earners. In the next section, I will state how this dissertation research contributes to and extends this research base.

2.4 TAKING BADGES TO SCHOOL

Implementing a school-based badging system represents an innovative program in that badging presents a form of recognition, assessment, and motivation in school that is not typically present. However, the idea of implementing an innovative program in a school is not new. The studies in this dissertation, especially the second study, are informed by the efforts of many to systematically implement technology-based, project-based learning in schools.

Project-Based Learning (PBL) is one innovation that, when implemented in schools, has contributed several insights into the challenge of bringing new programs into schools. As Barron and colleagues stated, "A major hurdle in implementing project-based curricula is that they require simultaneous changes in curriculum, instruction and assessment practices—changes that are often foreign to the students as well as the teachers" (1996). As a definition, PBL is a systematic form of instruction that seeks to engage students in a student-influenced inquiry process patterned around real-world and complex questions (Markham, Larmer & Ravitz, 2003; Blumenfeld, Kempler & Krajcik, 2006).

Based on practical experience of implementing technology rich, project-based learning experiences, Blumenthal, Fishman and colleagues in the Letus project (Center for Learning Technologies in Urban Schools) developed a framework for viewing innovations within schools (Blumenfeld et al, 2000; Fishman et al, 2004). In their approach to scaling project-based learning as an innovation in schools, they viewed capability, culture, and policy and management as being

key indicators for success.

Figure 1. Framework to evaluate the usability of innovations (Blumenthal et al., 2000; Fishman et al., 2004).

Viewing the theoretical cube in figure 1, capability refers to the ability of teachers and administrators to competently carry out the work necessary for the innovation's impact to be realized. For a badging system, teachers may be asked to use new technological tools and assess student performance in a way that is not tied to grades. Culture refers to the individual and collective beliefs and practices that the teachers and staff adhere to, and the extent to which a school's cultural elements support or hinder an innovation. For a badging system such as the one in this study, learning experiences are construed as interdisciplinary and outside of the classroom, which challenges traditional beliefs of school-based learning.

Policy and management refer to the structures and conditions created by both in school leadership as well as district and regional leadership that support or hinder an innovation. For the badging system, the school created a monthly meeting structure for participating teachers and teams of two teachers to facilitate each badge. This framework enables one to place an innovation within the cube to understand the gaps that exist between what exists within a school and what needs to happen for an innovation's potential to be realized. In other words, "The creation of usable innovations (and successful reform), conceptualized in this manner, is a process of working to 'close the gaps' that exist" (Fishman et al, 2004, p. 51). The idea of closing gaps is not confined to project-based learning implementation and the importance of alignment of curricula, professional development and assessment have been noted in larger reform projects (e.g. Cohen & Hill, 2001).

The gap that exists between what an innovative program imagines and what is currently takes place in schools represents a challenge for school change projects. This has been similar to what researchers have noted as a challenge for schools to productively leverage the Internet for teaching and learning. At least partly, a barrier has existed in implementation between teachers' extant instructional practices and more productive practices related to using the Internet (Schofield et al, 1997; Zhao et al, 2002).

2.5 TWO STUDIES TO CONTRIBUTE TO THIS LITERATURE

What is important to note from these studies is that we are beginning to see that understanding badges as a motivating factor in learning experiences requires going beyond the binary: they are motivating or they are not motivating We still know little about when, how, and for whom

badges may be productive elements of learning activities. One way to address these questions is to draw on the voice of the badge earners. The first study in this dissertation specifically addresses this through the qualitative approach that I have selected. In order to better understand the facets of badge user motivation, I interviewed badge participants to find out why they chose to participate and earn a badge. Previous research on badges mentioned above have predominantly looked at online environments and quantitatively studied the impact of badges on some outcome (Oktay, Taylor & Jensen, 2010; Anderson et al, 2013; Hakulinen et al, 2013; Abramovich, Schunn & Higashi, 2013). While these approaches are important and also reflective of the current state of badge implementations existing on online platforms, we still know little about the how and why of badge earner motivation.

Moreover, the role of a facilitator in the badging system has not been reported on yet, that I am aware of. While many badges are allocated in online systems through the moderation of users (Oktay, Taylor & Jensen, 2010; Kriplean, Beschastnikh & McDonald, 2008; Anderson et al, 2013) or through the execution of a game system (Bjork & Holopainen, 2005, Moore, 2011), as badges are implemented within learning settings—as the current philanthropic environment suggests it will be—it is useful to understand how teachers are involved with the system.

In considering the teacher's role in a badging system, I have chosen to focus on three conjectures about how the badging system may impact participating teachers. First, I examine the conjecture that the badging system provides teachers with new student information that teachers may be able to use to guide student learning and development. Second, I investigate the conjecture that the badging system provides teachers with new social arrangements to support collegiality and professional community. Third, I research the conjecture that the badging system impacts the participating teachers' instructional practice.

The two studies in this dissertation take the great opportunity to further our understanding of badges within a formal learning environment. In particular, these studies cut to the core of two important aspects of badges as mentioned above. The first study explores the ways in which students are motivated to participate in a school-based badging system. In the second study, I address the impact the badging system has on the participating teachers. Through these two studies, I will explore how attributes of the badges motivate students to participate in the badging system, and how badges and the badge earning process communicate information about the badge earners to their teachers.

3.0 METHODS

This research is part of a larger research project funded by the Covenant Foundation to evaluate and study the implementation of a badging system at a school in the southeast of the United States. This research is ongoing and is carried out in collaboration with Sam Abramovich from the University of Buffalo (formerly of the University of Pittsburgh), Meghan Bathgate from the University of Pittsburgh and Yoon Jeon Kim from Florida State University.

In order to not be redundant, the individual studies presented later contain detailed descriptions of the setting of the research as well the constitutive elements of the badging system. In addition, the individual studies contain detailed explanations of the methodological approach of each study. However, in the next section, I will provide a high level description of the methods employed for both studies.

3.1 DATA COLLECTION

Data collection for these two studies took place at two points in time: the end of year one of the implementation and the end of year two of the implementation. Badging program artifacts, student interviews, teacher interviews and one survey in the second year all have served as data sources in this larger research project. In order to address the questions in these two studies, I relied primarily on interview data.

3.1.1 Study One data collection

For study one, I drew on three sources of data: transcripts of interviews with students, documents detailing the badging system, and student work accomplished to earn a badge. However, interview transcripts were the primary source of data used in my analysis. This was an intentional choice based on the transcripts' ability to illustrate the phenomena of interest. Interviews took place over a four-day period in the spring semester, 2012. These face-to-face interviews were conversational and semi-structured following a protocol, but allowed for digressions and probing where saliency was found in students' comments. Although not directly part of this analysis, we also carried out interviews with participating teachers, which served to provide the researchers with additional contextual information as well as to confirm some of the statements that students made.

Three researchers interviewed nine students who had participated in the badging system and three who had not. The students were selected out of a pool of 20 who participated in the badging system in the first year. The selection of students who had participated in the badging system was based on a combination of student volunteering, availability, and the recommendation of teachers at the school. Recommendations were used solely to gain variability in students' achievement levels. Non-participating students were interviewed to provide potentially contrasting points of view. Interviews were conducted in empty classrooms during school-time near the end of the school year and available students were those who did not have class or another school-related commitment during the interview sessions. Each interview was approximately 30 minutes in length.

3.1.2 Study Two data collection

For the second study, I drew on interview data with teachers. In the first year of data collection, we piloted a teacher interview protocol to explore the extent to which the badging system was providing teachers with useful information about students and the ways the badging system may have impacted their instruction. These initial teacher interviews were transcribed and analyzed to identify salient themes that were emerging from their responses. These analyses served to inform a revised, semi-structured interview protocol for the participating teachers. Members of our research team interviewed eleven of the sixteen participating teachers one on one (2 were not selected because no student had chosen their badge). These interviews took place during a three day period in the Spring of 2012. The interviews took place in school offices or empty classrooms during the teachers' non instructional periods. I additionally interviewed the principal after all of the teacher interviews were completed. The interviews averaged approximately 45 minutes.

3.2 ANALYTIC APPROACH

In both studies, the analytic process began during the data collection. After each day of interviews, the researchers facilitating the interviews wrote analytic memos to identify themes from their interviews as well as document their impressions and assumptions generated from the interviews. These analytic memos enabled me to clarify the dimensions of the coding categories (Corbin & Strauss, 2008). The memos served to refine the conjectures based on the data, for example, fundamentally questioning if and how the badging system was providing teachers with

new information. These analytic memos were shared among the researchers and I discussed the memos with the researchers each day. All of the interviews were digitally recorded and transcribed verbatim.

Using a constant comparative method (Corbin & Strauss, 2008), I re-read the transcripts to find disconfirming data and revised the codes based on these additional readings of the data and weekly discussions with the research team. With each subsequent coding of the data, I recorded my coding and inferences in analytic memos. In parallel to the coding process, I was engaged in discussions with the research team. These served as chances to test out my codes and the inferences drawn from the codes with the research. Once the data were coded, I consolidated the analyses into an organizational structure for writing each of the study papers.

3.3 CONTRIBUTION TO THE FIELD

While the newness of badging research and the general newness of badges for learning was mentioned at the beginning of this dissertation, I thought I would briefly share one other example. In diagram 1, there is a Google Trends graph that I created based on the search terms “digital badges” (in blue) and “badges education” (in red). This graph represents instances in which those search terms were used within the timeline of the graph.

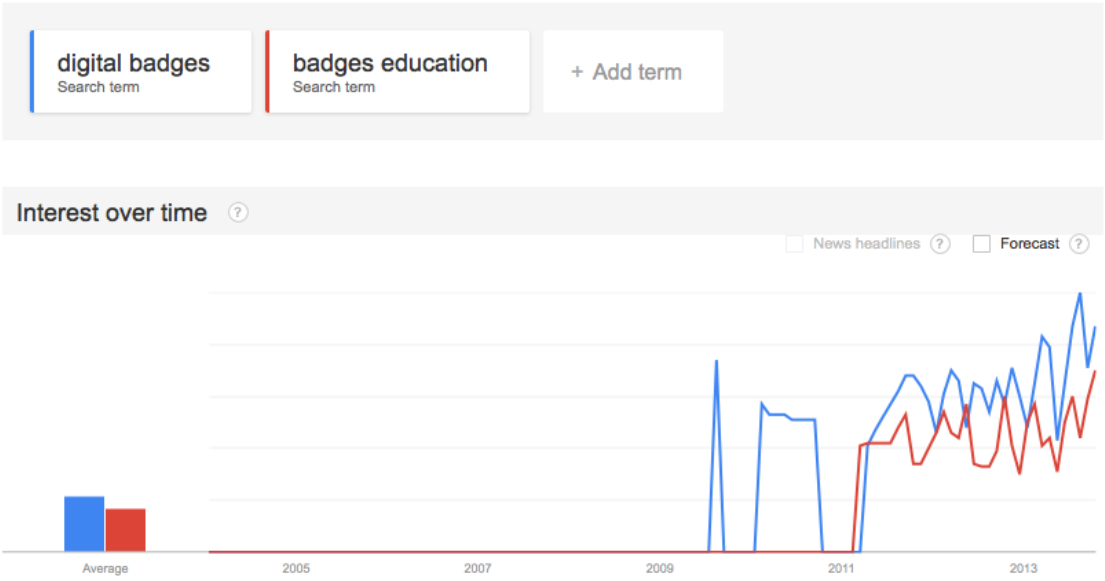

Figure 2. Frequency for search terms for badging

Because of the estimations that may be involved in the search algorithm, the exact number of searches is less important. From this graph, the highest number for blue is 100 in August of 2013 and 70 for red in October 2013. However, what is clear from this graph is that before August 2009, the term "digital badges" does not show up as a hit, and not until April 2011 do both "digital badges" and "badges education" continuously appear in the graph.

As a nascent space of research, both of these studies are contributing to an emerging field. As I will elaborate in the discussion, the first study suggests design elements that may be important for designing badging systems. As the data suggest and as I report in the study, the badge itself does not buy the accompanying learner motivation, but rather must speak to the learners' goals and values, and the way they perceive the badge to be novel. This is important for design for several reasons. First, the study generally problematizes badge earner motivation and connects badge earner motivation to theoretical elements of motivation. Second, those elements, like motivation linked to one's values, suggest that badge systems may need to reflect the values

of the those earning the badges. However, up until now, there has been little evidence of what those elements might be.

In addition, these findings provide guidance for interventions related to badges. If an investigation wishes to enhance the motivation of a badging participant based on some features of the system, these findings suggest some possible candidates. For example, if a badge earner wants to be publically recognized for their skills and experiences, the badging system can include elements that seek to make public badge earners accomplishments. In the case of this implementation, this included a tangible badge that a student could wear, a public awards ceremony and pictures of badge earners on a school hallway bulletin board.

In the second study, the data suggest that the badging system may have the added value of providing teachers with new information about students. As a potential vehicle for data informed instruction, it is worth noting that the categories of student data made available through the badging system are broader than the predominant student data systems found in school. In other words, categories such as students' interests have not typically been considered part of the corpus of data in the data-driven instruction literature (e.g. Knapp, Copland & Swinnerton, 2007; Marsh, 2013).

However, the data also suggest that the badging system did not have a substantial impact on teachers' professional interactions or their instruction. These two findings are noteworthy for several reasons. First, with the badging system implementation taking only minimally into account for teacher interactions, prior research suggests that more attention may need to be directed toward this aspect of implementation in order to gain greater traction and sustainability at the school site. In addition, as the badging system may introduce new tools and practices that could have an impact on teachers' instructional practice, prior research suggests that

intentionally designing for teachers to gradually take on new practices may need to be accounted for. Overall, these two studies taken together suggest that designs of a badging system in a school-based implementation can take into account not only the badge earners, but the teachers who serve as guides or facilitators in the badge-earning process.

In general, the fact that these two studies take place in a school is also of interest to researchers interested in badges. While many badging efforts have targeted informal learning settings like museums, 4H programs and afterschool programs, there are also small badging programs that have started in school districts in cities such as New York, Philadelphia and Chicago.[7] The results from the second study suggest that teacher involvement in the badging system served as a vehicle to build relationships with students. While this has been important in school improvement efforts (e.g. Wentzel, 2010), informal learning organizations often have idiosyncratic participation by youth, which can make sustained relationship building difficult. Thus, this can inform the design and implementation of badges and what a badging system can offer the teachers or facilitators.

Thus, the contribution of this work is partly in how these studies generate hypotheses related to the role badges play in learning environments. I acknowledge that these are small-scale studies from a single setting. However, as hypothesis generating work, these findings can, in Kelley's terms, be seen as contributing to model formulation of badging systems rather than a model estimation or model validation (2004; see also Sloane & Gorard, 2003). In emerging as well as established fields, there are hundreds or thousands of hypotheses that scientists can test. However, understanding what the powerful hypotheses are that can further our understanding

[7] Finding these examples and others can be done by navigating this site: http://dml4.dmlcompetition.net/

within a field is an important role for research (Kelley, 2004). As an emerging field, this work aims to develop powerful hypotheses related to motivations behind student participation in badging and how badging systems can serve as useful tools for those facilitating the learning process.

4.0 A SCHOOL-BASED BADGING SYSTEM AND INTEREST-BASED LEARNING: AN EXPLORATORY CASE STUDY

Engagement and motivation amongst students is an established challenge to school success (Fredricks, Blumenfeld, & Paris, 2004; National Research Council and the Institute of Medicine, 2004). With the link to learning firmly established, increasing engagement and motivation in students is sought as the key to implementing ambitious instructional units (Blumenfeld, Kempler, & Krajcik, 2006). While engagement and motivation are constituted in a variety of ways, a key aspect of both is student interest. However, student interest has been addressed in schools with mixed results. (e.g., Hidi & Renninger, 2006; Tobias, 1994; Hidi, 2000;).

Consequently, education reformers are seeking out novel, effective ways to promote student interest in formal school settings. Proponents suggest educational badges and badging systems as a way to connect and enhance student interests (e.g. Mozilla, 2011). The purpose of this study was to identify and explore the connection between student interest and badges qualitatively and provide documentation of various factors that constitute student interest in the context of a badging system in a formal school environment. We conducted a small-scale study of a school-based badging system: a collaborative project between an independent school, the Covenant Foundation, and Global Kids, Inc. Our goal is to inform potential and current badging system implementations by highlighting relevant motivational factors and to present implications for designers and practitioners of future badging systems.

4.1 BADGES AND LEARNING ENVIRONMENTS

Described as "… a symbol or indicator of an accomplishment, skill, quality or interest" (Mozilla, 2011), badges are public representations of what one has learned and experienced (Plori et al, 2007). Badges have been used to indicate accomplishments, skills, identity, values, credentials, and interests in digital environments (Antin & Churchill, 2011) as well as face-to-face environments. In education, badges have also been used to motivate students to set goals and represent and communicate achievements within a learning community (Abramovich, Schunn, & Higashi, 2013; Abramovich et al, 2011; Halavais, 2011; Higashi et al, 2012). Perhaps the most well-known educational badges are those of the Boy and Girl Scouts' merit badge system. In scouting organizations (e.g. Boy Scouts, Girl Scouts) children can choose a badge based on their interests, and follow through with activities to meet certain requirements to earn the badge. For example, a boy scout might select the entrepreneurship merit badge if he is interested in learning about how to start and run a business. To earn that badge, he will need to come up with a business plan, and then conduct a feasibility study (Boy Scouts of America, 2012). Once he has earned the badge, he can then display it as a representation of a level of competency and accomplishment.

Advocates for badges in education commonly point to the potential for badges to act as assessment for expertise or learning typically undocumented by formal education institutions. However, badges are not limited to simply offering an alternative model of credentialing (Joseph, 2012). Badges could connect to student interests and motivate learners by allowing for feedback and reward outside of traditional assessments. It is this advantage of badges, the extent to which a badging system can connect to learners' interests and motivation that we investigate in our study.

4.2 THEORETICAL BACKGROUND

In order to investigate the ways in which a badging system can connect to interest-based learning, we drew on two motivational theories: Expectancy-Value Theory (Eccles, 1987; Eccles et al., 1983; Eccles & Wigfield, 2002; Wigfield & Eccles, 2000) and Cognitive Evaluation Theory (Deci & Ryan, 1985; Ryan & Deci, 2000). While a variety of theories could be utilized to investigate interest-based learning, these two theories were chosen due to their relationship to children's motivation and persistence in an activity and serve as a lens by which we could determine what motivational aspects of badges can exist.

4.2.1 Expectancy-Value Theory

Since expectancy-value theory was conceptualized (Eccles et al., 1983), it has been applied extensively to a variety of settings including both academic and non-academic contexts (Eccles & Wigfield, 1995). Expectancy-Value (E-V) considers the generally positive relationship between individuals' expectancies, or expectations, for performance and the reasons they value a particular task or domain. These expectations and values are thought to be domain and task specific, as people can hold varying levels of expectations paired with different values towards specific content (e.g., mathematics, video games). Contextual changes between content areas, such as how information is conveyed or how learning is demonstrated, can be associated with distinct social and cognitive factors that may affect a child's expectation and value towards that task. For example, a child's perception of their ability to play soccer is not necessarily related to their perception of their ability towards mathematics.

Eccles, Wigfield, and colleagues (1983, 2002) distinguish between different types of task-value, many of which were salient in our coding scheme. Specifically, we examined why a child chose to participate in a Badging system, which helps us explore the values the children hold towards a task and its content. E-V theory posits that choices are related to both the positive and negative features associated with a task and choosing to perform a particular task occurs at the expense of participating in alternative activities. In this sense, the likelihood of a child investing in a badge system and the activities within that system may depend on their valuing participation at the expense of alternative choices.

The expectancy dimension of E-V Theory encompasses individuals' expectations for success in an upcoming task (*task specific*) as well as their overall beliefs about their abilities in a particular domain (*domain specific*). While there has been evidence that young children do not always distinguish between their expectations for success for a task (e.g., how they expect to perform on an upcoming math test) and their overall ability beliefs in a domain (e.g., their mathematic ability) (Eccles & Wigfield, 2002), we chose to code for these instances separately, as they may be distinct in badge systems. For example, a student might decide to pursue a badge because they believe it to be a task where they can succeed, even if the content area associated with the badge is one that they struggle with in formal academic settings.

Children can value a task for the personal connection they associate with that task, as it relates to aspects of their identity and self-schema. In other words, if a task affords the opportunity for a child to confirm or develop his or her perceived self-schema (e.g., "I am a person who is good at computers so I will earn the information literacy badge"; "I always am the first to try new things"), they are more likely to place high value on the task, and will be more

likely to engage in that activity. A student might pursue a particular badge because they believe it to be an accurate representation of their level of knowledge.

Additionally, a task may hold intrinsic value for a child. Intrinsic value refers to a children's interest in a task and is closely related to the concept of intrinsic motivation (Deci & Ryan, 1985). This value dimension also refers to the enjoyment children receive from participating in a task. A task holding high intrinsic value for a child would be of interest for the specific content of the task. The child may find participating in the activity enjoyable, often expressing enthusiasm towards the task or domain. In our data, when some aspect of the badging system possesses intrinsic value for the child, she may describe her liking or loving the content related to badge ("I just love computers").

Intrinsic value differs from utility value, in that utility value refers to a child valuing a task for its usefulness towards another goal not necessarily related to the current task. In the case of utility value, children may not be particularly interested in the direct content of a task or even find that task particularly enjoyable; nonetheless, they may value this task for its support towards meeting a current or future goal (e.g., high-school or career aspirations). A child expressing utility value may say, "I chose to earn the information literacy badge because I will need to learn how to use a computer and assess the credibility of online information when I get a job." This child may not enjoy the content or process of this course, but is likely to participate in the activity due to what that the content affords them in relation to their future goal. Due to the potential lack of relationship to the content of the task, utility value somewhat mirrors the concept of "extrinsic" motivation in self-determination theory (Ryan & Deci, 2000).

Both expectancies and values are important to consider when examining children's motivation towards engaging in an activity. While these dimensions can be considered

independently, they exist more dynamically in the real-world experience of a child in a social context. Often, a child's expectations and values have a multiplicative effect, in that the greatest motivation and achievement can be found when a person holds high levels of expectancies for success, confidence in his or her abilities, and value for the task at hand (Nagengast et al., 2011; Shah & Higgins, 1997). In a badge system, a single badge could capitalize on this multiplicative effect by appealing to both expectancies and values for students.

4.2.2 Cognitive Evaluation Theory

Cognitive Evaluation Theory (CET) is a sub-theory of self-determination theory that posits that intrinsic motivation towards an interpersonal task can be increased when the task is structured to allow for both a feeling of autonomy and competence (Ryan & Deci, 2000). The contextual structure of a task, including the type and degree of feedback a child receives, the rewards related to performing a task well, as well as how information is communicated, can all influence a child's intrinsic motivation towards engaging in a task (Harackiewicz, 1979). According to this theory, by encouraging both a sense of autonomy and competence, a task can aid individuals towards meeting a basic psychological need for competence; therefore, increasing the likelihood of a child's participation through their intrinsic motivation towards the task.

A child's sense of autonomy relates to her perception of her choice to engage in a task and influence its progression, whereas perceptions of competence relate to capability or proficiency towards completing a task. Similar to E-V theory where both expectancies and values meaningfully combine, CET states that a feeling of competence alone is insufficient to promote higher levels of intrinsic motivation. This sense of competence must also coincide with perceptions of a task being autonomously selected (Ryan, 1982). For example, when earning a

badge, this might include students' selection of a badge, selection of a task to earn the badge, as well as their sense that they are competent enough to earn the badge. Additionally, CET argues that intrinsic motivation can only be supported when a person initially has some degree of intrinsic interest in the content of the task. A task must appeal to a child for its novelty, challenge, or aesthetic value in order for intrinsic motivation to be encouraged (Ryan & Deci, 2000).

An additional aspect of CET is the concept of rewards (i.e., a tangible or intangible consequence given for performance of a task). While rewards are known to influence the context of an activity, there is debate about the role they play towards children's motivation. There is literature demonstrating the negative impact external rewards can have on children's intrinsic motivation for an activity (Deci, 1971; Lepper, Greene, & Nisbett, 1973; Deci, Koestner, & Ryan, 1999). However, there is discussion regarding the structure of a reward itself (e.g., how connected it is with the content of the task; how externally imposing it may be) relating to such consequences. Additionally, there is evidence that externally motivated actions, paired with a perception of autonomy, can lead to positive learning and engagement in a task (Skinner, Wellborn, & Connell, 1990; Grolnick & Ryan, 1987). We felt it necessary to examine rewards in the context of badging since earning a badge was accompanied by various additional rewards in addition to the reward of the badge itself.

While some aspects of both E-V theory and CET overlap to some degree (e.g., confidence in abilities according to the expectancy dimension of E-V theory and feelings of competence in CET), the frameworks remain theoretically distinct and provided differentially meaningful coding outcomes. Consequently, these two distinct theories provided us with a framing to describe the ways that the badging system connected to students' interests. To this

end, we generally relied on the way students described the expectations for success they had for participating in the badging system, what elements of the content they valued in their participation in the badging system, the sense of autonomy and competence they perceived, and the rewards that were embedded in the badging system.

4.3 METHODS

For our study we investigated a badging system implemented at an independent school, primarily relying on interviews with students, interviews with teachers, and design documents to provide context and confirm some of the students' statement. The qualitative focus of our study seemed particularly appropriate for understanding students' perceptions of their engagement in the badging system and aided in providing rich accounts of their participation in their own words.

4.3.1 Site

This study took place at an independent, religious-based school located in a suburban area in the Southern United States. The school enrolls approximately 500 students in early childhood programs through eighth grade. Instructionally, most teachers integrate project-based instructional units into their curricula and utilize an array of software packages in order to support content learning as well as expose students to software that may be useful in the future.

4.3.2 The badging system

In describing the school-based badging system (SBBS), it is worthwhile to note our intentionality of referring to the system instead of simply the badges. Similar to what Cobb and Jackson refer to as an instructional system (2008), there are tasks, activities, tools, and discourses related to badges that are interdependent and together constitute the system.

The SBBS was designed to support the development of what Henry Jenkins cites as the necessary skills for the 21st century's participatory culture (Jenkins, 2009). Specifically, the targeted skill set includes skills that are useful both in and out of formal education environments and that rely on mastery of digital media. These skills are considered important for future success even though they are not traditionally part of formal educational curricula.

The specific learning goals were reflected in four different types of badges: information literacy, collaboration, acceptance, and empowered learning (Table 1). The learning objectives provide general descriptors of what the students will be able to do to demonstrate competency for each badge.

Table 1. The Four Badges in the System with Learning Objectives

Badge Name	Learning Objectives
(Sergey) **Brin Informational Literacy Badge**	Badge earner demonstrates ability to identify the need for information, use effective strategies to seek out information, parse significant information from less significant information, critically evaluate the credibility of information, and synthesize information from multiple sources.
(Elana) **Kagen Empowered Learner Badge**	Badge earner demonstrates ability to learn independently through preparation, self-assessment, skill assessment, and perseverance.
Elie (Wiesel) **Acceptance Badge**	Badge earner demonstrates ability to recognize one's values and beliefs, successfully negotiate a shared understanding with and fair treatment of those different from oneself, and standing up for targets of prejudicial treatment.
(Ruth) **Messinger Collaborating Badge**	Badge earner demonstrates ability to collaborate within a group to develop creative solutions to complex challenges by employing the resources at hand and assuming varied roles while considering divergent points of view and negotiating for mutual benefit.

Students selected a badge and were then, over the course of the school year, asked to supply evidence indicating completion of three distinct learning phases: **Recognize It, Talk About It** and **Do It**.

The **Recognize It** phase required students to indicate understanding of the targeted skills of their selected badge. The **Talk About It** phase required students to show evidence of their ability to communicate effectively about the badge. The final phase, **Do It**, asked students to supply evidence of their mastery of the badge content. Each student's evidence was compiled into a digital transcript that served as a record of his or her badge progress. In Figure 3, we can see the digital transcript. Each triangle represents a potential competency space. As a student completed each piece of the badging process, for example the **Recognize It** phase, a corner of the triangle for the competency would be filled in. When all three corners of the triangle are filled in, this signifies that the badging process is complete and the student has earned the badge.

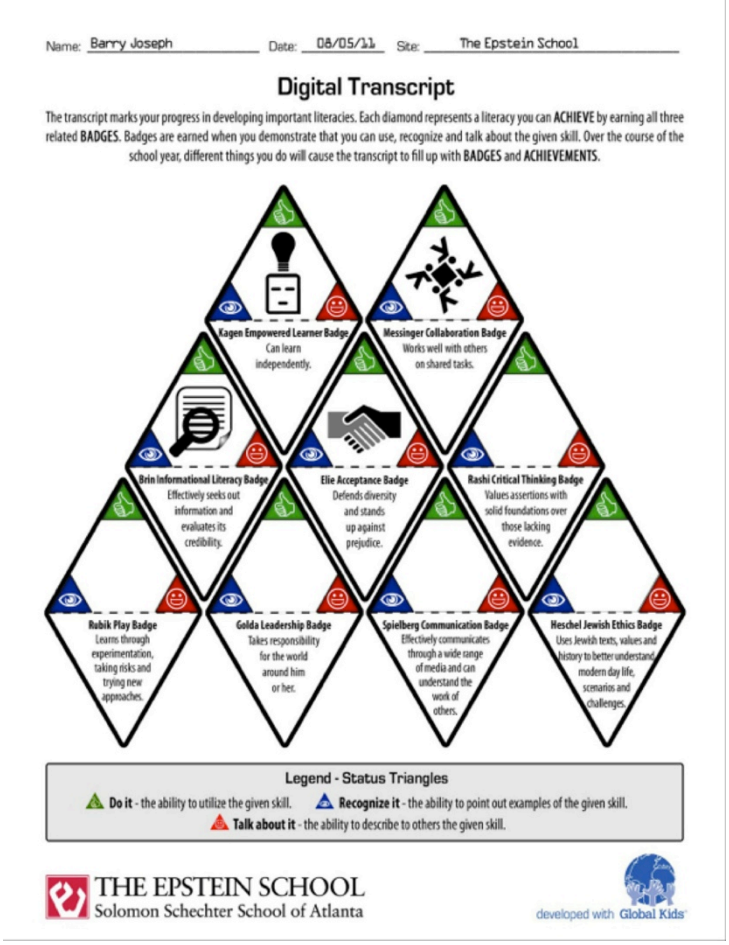

Figure 3. Digital transcript: Making the badging process visible

The school's teachers served as determiners of the quality of the evidence and whether a student passed each badge phase. We have included an example rubric in appendix one. Upon completion of each badge phase, students were rewarded for their success. The rewards included ceremonies where students received an indicator of their accomplishment in the form of a wearable badge. In Figure 4, we can see an example of the actual badge. The badge says,

"Badger At Work" with an accompanying picture of a real badger. The badge can be worn around a student's neck to publically recognize their work.

Figure 4. Wearable badge award

Non-tangible rewards were also associated with earning badges. These rewards were called power-ups. The power-ups included additional in-school privileges such as unsupervised computer time or the ability to leave a class to work on completing the next badge phase. Upon most participants' completion of their badges, which coincided with the end of the school year, badge earners would get an exclusive catered lunch and a field trip related to their badge. For example, those students who earned the Informational Literacy Badge were promised a trip to the local office of Google. It is important to note that participation in the badging system was entirely voluntary and incompletion of a badge contained no repercussions besides lack of reward.

The badging system was co-developed by faculty, staff, and students at the school in partnership with Global Kids, Inc., a leading non-profit educational organization for global learning and youth development. Global Kids, Inc. works to ensure that urban youth have the knowledge, skills, experiences and values they need to succeed in school, participate effectively in the democratic process, and achieve leadership in their communities and on the global stage. Global Kids, Inc., prior to working with the school, had developed badging systems for various schools and after-school programs. Consequently, the school-based badging system has certain core features similar to other Global Kids, Inc.-created badging systems. For example, the design of the SBBS included student participation. Similar to prior Global Kids, Inc. badging systems, specific students were selected by school administration and asked to offer their opinions and suggestions during the initial design of the badging system. Other features that the SBBS shared with prior Global Kids, Inc.'s efforts included the distinct phases toward badge completion and the use of digital transcripts.

Other features of the badging system were designed based on the independent school's mission of Jewish education. The school integrates Jewish values into its curriculum, instruction, and facilities and, consequently, certain features of the badging system were also designed to integrate specific Jewish values. The badges were named after famous Jewish individuals who were selected based on their appropriateness to the badge learning goals as well as suitability as role models. We can see this in Table 1 where Sergey Brin, one of the founders of Google, is associated with the information literacy badge. The badges were all designed to be compatible with Jewish values as well as allow for integrations with specific Jewish curricula such as Hebrew Language or Judaica.

In addition to these aspects of the design of the system, administration and teacher participation were key to the badging system's implementation. The SBBS had the support of both the head-of-school and the middle school's principal. Specific teachers were given the task of both participating in the design process and also the daily implementation of the badging system. The teachers' vigilance, in spite of several challenges of implementation was crucial to the badge system's functionality.

Consequently, the SBBS provides an appropriate case to explore the relationship between a badging system and participating students' interest-based learning. Drawing upon Expectancy Value Theory as well as Cognitive Evaluation Theory as a means of characterizing student interest, we sought to describe the ways in which students' interests were related to their participation in the badging system as well as their choice to engage in the badging process for specific badges. In the next section, we will describe the design of our investigation.

4.3.3 Data collection

We drew on three sources of data: transcripts of interviews with students, documents detailing the badging system, and student work accomplished to earn a badge. However, interview transcripts were the primary source of data used in our analysis. This was an intentional choice based on the transcripts' ability to illustrate the phenomena of interest. Interviews took place over a four-day period in the spring semester, 2012. These face-to-face interviews were conversational and semi-structured following a protocol, but allowed for digressions and probing where saliency was found in students' comments. Although not directly part of this analysis, we also carried out interviews with participating teachers, which served to provide the researchers

with additional contextual information as well as to confirm some of the statements that students made.

Three researchers interviewed nine students who had participated in the badging system and three who had not. The students were selected out of a pool of 20 who participated in the badging system. The selection of students who had participated in the badging system was based on a combination of student volunteering, availability, and the recommendation of teachers at the school. Recommendations were used solely to gain variability in students' achievement levels. Non-participating students were interviewed to provide potentially contrasting points of view. Interviews were conducted in empty classrooms during school-time near the end of the school year and available students were those who did not have class or another school-related commitment during the interview sessions. Each interview was approximately 30 minutes in length.

We acknowledge that our sample size limits the inferences we can make to the broader population of students. However, there are some affordances of the site and the participants that guided our selection. Because we sought an active, school-based implementation of a badging system, we accepted a small sample size in exchange for the likelihood that our data would allow us to examine the relationship between badges and interest. In addition, this purposeful selection of our sample of students participating enabled us to explore our phenomenon of interest (Cresswell, 2005). That is, we perceived our site and participants to provide useful information with respect to badging and students' motivation and better understand the phenomenon (Patton, 1990).

4.3.4 Analysis

The analysis process began during data collection. After each day of interviews, the three interviewing researchers wrote analytic memos to clarify the dimensions of the coding categories (Corbin & Strauss, 2008). All of the interviews were digitally recorded and transcribed verbatim. Interview transcripts were uploaded to Dedoose, a web-based platform, where we coded our data[8]. The coding schemes were developed based on our theoretical framework and prior research (Green, 2002; Ryan & Deci, 2000). This research provided specific labels for codes that we used as we analyzed the data. Qualitative coding for student interest under an expectancy-value framework has been found useful in other data sets using a similarly aged sample (Bathgate, Schunn, & Sims-Knight, in review).

The theoretical framework provided the analyses with inductive themes with which to identify dimensions of motivation. These themes included rewards, values, personal connections, recognition and enjoyment and independence. These themes served to provide a detailed description of student motivations and interests as they related to the badging system.

The research team wrote descriptions of these themes before beginning the analysis in order to reach consensus on how to apply the codes. The research team met in stages throughout the coding process to read and discuss the transcripts, as well as to clarify and refine the coding scheme. Four researchers independently coded a set of three transcripts, and all transcripts were discussed in the group. All of the coded transcripts were available to all of the researchers.

We sought credibility in our analysis through a number of strategies (Lincoln & Guba, 1985). First, we sought to maintain methodological consistency through our data collection and

[8] The website for this platform is: http://www.dedoose.com

analysis (Morse et al, 2002). Therefore, our data and analysis were aligned with our research question and theoretical framework. This was not intended to constrain our analytic process but to ensure a "trustworthiness" (Lincoln, 1995) in that our point of inquiry, analytic approach, and analysis were carried out systematically and as intended. Second, we maintained regular open and critical discussions of our analysis within the research team. This allowed us to compare each other's codes, challenge one another's analysis, and refine our own coding definitions to reach a common understanding for our group. When consensus was not immediately reached, additional examples were brought to bear from the data for discussion and the coding category was refined until consensus was reached. Third, we shared an initial draft of our research report with the teachers and other collaborators to check our interpretations, the logic and the applicability of our analyses. Further revisions were made based on this member checking.

4.4 RESULTS

Conceptualizing and capturing evidence of interest is complex. The findings suggest that student participation in the SBBS was related to an array of dimensions that the students perceived in the badging system. These dimensions or themes serve to provide a description of how students' participation in the badging system came to bear on their interests. Through our analysis, we highlight themes related to student interest that were predominant in their responses: enjoyment and independence, recognition, value, personal connection, and rewards. While there is some overlap, these themes supply us with distinct interest-related elements present in students' responses. It is also important to note that these themes come directly from the theoretical lenses with which we approached the study: cognitive evaluation theory and expectancy-value theory.

The themes provide us with data to provide a more specified articulation of students' motivation to participate in the school's badging system.

The SBBS allowed students to distinguish themselves from their peers through extra effort. The SBBS was voluntary and so this extra effort was above and beyond the day-to-day work in the school. Moreover, the SBBS embodied features that the students valued such as being innovative, new, and building skills they deemed necessary in their personal life. In addition, the SBBS was seen as a conduit for connecting achievement to a students' identity either through exposure to the content of the badges or the activities completed to demonstrate badge competency. Finally, the rewards associated with the badges were quite prominent in the students' responses. These rewards included the badges themselves as well as the in-school and out-of-school benefits they gained through engaging in the badging process like additional freedoms in school and fieldtrips out of school.

4.4.1 Enjoyment and independence

When students talked about their participation in the badging system, they often spoke about the appeal of doing something fun. For example, one student described the appeal of the SBBS as, "I think it's a way to make learning a lot more fun, a lot more exciting and intriguing." Another student similarly stated, "I think everyone likes to do it because they're new, they're different and most people like the new trend thingies." Even amongst students who did not participate in the SBBS, perception was that badges were a fun activity. One student said, "…it looked fun and I'm sure it felt good to succeed in getting your badge and being trusted by your peers." This enjoyment or fun often overlapped with other aspects of our analysis and was evident in the way

the students expressed how the badges enabled them to be somewhat autonomous in the badging process.

Students also expressed a sense of autonomy associated with their participation. One student described her non-badge schoolwork as, "I don't want it to seem like we have no freedom or independence at all, but…" then described two parts of the badging system that afforded her more agency. She said, "One, you're not obligated to do it; two, you go at your own pace. You can go whatever pace you want. I guess it because you get to choose. You get to choose; you get to go at your own pace. Now you have more freedom." Here she highlights that the badging system was completely voluntary, which was a point often made by participants and non-participants alike. She also mentions the fact that she could move at her own pace in accomplishing her badge-related work. As another student said, "…you don't have a deadline." Interestingly, students also recognized their autonomy as limited by deadlines. As our interviews were taking place, many of the students also made clear that they understood that the school year's end was rapidly approaching and that presented a clear deadline for completion. It is also worth noting that none of the students had completed more than one badge, which was possibly a result of self-pacing.

By design, the SBBS fostered students' sense of autonomy by enabling students to choose whether they participated, which badge they wanted to earn, and how they demonstrated their competence for the badge. During the Recognize It and Talk About It phase of the badging process, the students demonstrated their understanding for specific badge content by choosing what are appropriate tasks to demonstrate their competence and communicate that competence. One student said, "In school we learn about science in a book, but for this badge you get to say what you think about it and not what the book says." The student highlights that authority or

ownership of knowledge and the learning process belong to him and not necessarily what is written in the textbook.

The themes of enjoyment and independence that we identified in the badge system are aligned with CET. In prior research, data have suggested that one's sense of personal autonomy on a particular task is important for intrinsic motivation (Ryan & Deci, 2000). Moreover, the students' perception that earning a badge as being enjoyable relates to Expectancy Value Theory and reveals a perceived aspect of the badging system that the students valued as important. These too were salient themes in the students' discussions about their participation in badging.

4.4.2 Recognition

By analyzing students' responses for expectations associated with working for badges, we noticed that student participation was related to high aspirations. More specifically, students expressed expectations that earning badges required effort beyond what they perceive as minimal. Consequently, students described how the SBBS provides an opportunity to receive recognition for their effort.

Many students saw the badging system as a way to show they have high aspirations or that they want to do more than expected. One student said of working on badges, "I think it shows that it's harder working. I will try my best to get more in there than needed." This student is saying that he wants to provide more examples of work in order to earn his badge. According to him, this also demonstrates the effort that he is putting forth. Similarly, another student said, "I wanted to push it a different level. I don't like just the bare minimum. I like going out there for more stuff."

In order to achieve a badge, students were able to draw upon work they had been doing in other classes, outside of school, or initiate completely new work. In this way, the badging system could validate the value of work students were already engaged in or initiate new projects for students. This, too, provided a way for students to highlight their effort and desire to go above and beyond. One student said, "…showing work that you've already done during school, and being able to put it out what you felt like you thought was good about your work, I think it's harder to do. I thought that was better." Here the student is illustrating that the SBBS allowed her to identify and show work she was doing from other classes to fulfill her badge requirements.

The theme of recognition, which we identified in the data, can be seen as being related to Expectancy-Value Theory and Cognitive Evaluation Theory. For example, some students perceived the badges as enabling them to show good work that they done in school suggests that badging system allows them to show what is important to them. However, one could also use recognition to show that engaging in good work and doing more than what is expected of the student provides an opportunity for self-expression.

4.4.3 Values

What students valued about the badging system suggests the most appealing aspects of the SBBS. We can think about these values as elements of the badge system that drew participation. These values coalesced around some general themes of novelty, utility, challenge, and personal connection.

Many of the students noted the novelty of the badging system as being something they valued. For example, one student noted, in comparing typical activities in school to the SBBS, "It's still educational … you do it on your own time and you don't have to do it. It's not required.

It's completely optional and there's not really a time limit." This student is saying that the fact that you can work on the badging work at your own pace combined with its voluntary nature is different than what typically occurs in school. Another student mentioned, "I thought it would be different; I wanted to try something new. I've never done anything like this before and I thought it was a cool new addition for the school."

Several students stated that there was utility to participating in the badging process, whether that meant they thought the process was useful for learning something new or useful in preparing themselves for their future. While acknowledging that the SBBS's newness was appealing, many students also recognized that the SBBS serves a greater purpose in their long-term goals. For example, one student said, "…what I had originally signed up for—one, I was looking forward to something to go on my record." Another students said about badges, "…those are gonna be on your resume and if you're applying for a certain job, then certain badges would help. If you're applying for a research job, then the information literacy badge would help." For this student it was less important which badges will sustain some sort of place in their permanent record or even aid in their finding a job. Rather, the badge was fulfilling a role for the students that they saw as preparing them for the future. As one student referred to it, "…an extra credit thing that will get you something on your record…"

However, students did not just connect their badging participation with their long-term career goals. Some of the students saw their participation in the SBBS as learning skills they identified as needing or wanting. For example, one student mentioned that she was earning the collaboration badge because it was addressing a skill she needed to work on. She said, "I sort of need to work on working in groups." Similarly, students spoke about how the information

literacy badge served a similar purpose. One student stated, “I love technology, I love—well I mean I like getting the right information. I don’t like having the wrong information.”

The prominent theme of values that we identified in the data aligns to Expectancy Value Theory. This theory specifically highlights the generally positive relationship that exists between individuals’ expectations for performance and the reasons they value a particular task.

4.4.4 Personal connection

Participation in the SBBS gave students an avenue to personally connect with work they were doing in school. For example, students saw choosing a particular badge naturally aligning with who they are and what sorts of activities they do. One student earning the information literacy badge said, “Using technology, finding useful information; that’s mostly what I would do.” Likewise, another student earning the acceptance badge mentioned, “I’m big on acceptance and equality and just stuff like that.” In both cases, the students associated the requirements for their selected badges with what they like to do and who they are. While this can be seen as a way that the SBBS is validating activities that students are engaged in outside of school, this personal connection also indicated that the SBBS supplied a chance for students to deepen their own understanding of their interest.

To illustrate this we looked specifically at the acceptance badge. Although some students were drawn to the acceptance badge because it coincided with an important idea that they held, engaging in the badging system also granted an opportunity delve into what it means to be accepting. For instance, one student spoke about this,

“I’ve always been a little more into like acceptance and just more than just,

> oh accept people for who they are, blah, blah, blah, just more interested in that than my peers. I sort of realized that *(through the badging process)* there're a lot of people that—and it's not like everyone's against people that are accepting, there are people that are different. I've sort of been very defensive, so—just sort of being more—just sort of learning about how other people look at acceptance."

In this quote, the student first describes how acceptance has been an interest of hers in the past and how that interest has been different than that of her peers. The quote then goes on to show how the badging experience has exposed her to how people view acceptance. In this way, she is describing how she is learning how she is being perceived as someone who expresses tolerance for others.

The SBBS additionally connected to students who see themselves not only in their relation to the content of the badge, but also how they demonstrated their competence. This was evident through comments on the software tools, like Voicethread and Hyperstudio, which students used to complete different badge phases. For example, one student stated, "I decided I wanted something different that just shows what I like doing, taking pictures and not exactly being in front of the camera. I decided that would be more what I like to do." In this quote, the student expressed his preference for using a camera. Consequently, the student generated badge work that included pictures or videos.

The theme of personal connection that we identified in the data aligns with Expectancy-Value theory of motivation. Similar to what the theory posits, that students can value a task for the personal connection they associate with it, our data suggest that students' motivation to earn

a badge could be partially explained by the fact that the badging process reinforced their perceived sense of self.

4.4.5 Rewards

The SBBS provided opportunities for students to earn rewards through progress toward earning a badge. Student descriptions of the rewards suggest that this was a key motivating factor for their participation. There were three ways that the students primarily discussed the rewards. First, there was the importance of receiving a reward. Second, there were the school-based benefits that students received by participating in the badging system and earning their badges. Third, there were out-of-school benefits that students also noted as being important.

As mentioned prior, the extra rewards that students received through earning a badge were called power-ups. One student summarized the importance of power-ups this way:

> Interviewer: If another school wanted to have a badging system like you guys have and they wanted to hire you as an advisor or as a consultant to help them, what do you think the best parts of the badge system are that they should make sure that they have?
>
> Interviewee: The power-ups.
>
> Interviewer: Yeah? What would you tell them about the power ups that are important?
>
> Interviewee: You have to have good power ups related to your school. We don't have good food so if we get a special lunch, it's good. [Laughter] That's a good power up for our school. If they have good food, then

> they could have other stuff that relates to the school that they need to improve on. They could have one day, if they're not that rich of a school and they don't have that many computers, they could have one computer day and stuff, to work on the computers.

There are at least two points worth noting in the student's comments. First, the student states that the power-ups, or rewards, are a significant part of the digital badging system. In fact, the power-ups are labeled the best part of a badging system and integral to its success. Other students made similar statements. Second, this student states that the rewards should be tied to a need or want of students. That is, the benefits of the badging system need to be informed by what the students want and what they would see as valuable.

Students noted that the badge was a tangible reward that they received and appreciated. Although there was a prominent digital aspect to the badging system, the tangible aesthetic element of the badge was noted by students. For example, a student noted, "…it has a picture of a badger digging up something. Then on the back, it says your name." Here the badge is not just a web-based or digital symbol, but something students can see, wear and show-off to others.

This tangible aspect of the reward also led to in-school and out-of-school benefits that students saw as desirable. By in-school benefits or rewards, we mean that the students received some benefit that enabled them to opt out of an aspect of the school day or gain some additional autonomy (i.e., unsupervised time). For example, one student stated, "In school they're like personal benefits. We get like—when we got the first badge we got an actual badge. So like if we wanted to leave at, like I said, writing class, we could go put on the badge and go down to the computer lab to work on our badges." This kind of benefit was not lost on the student who did

not participate in the badging system. One non-participant noted of the students participating in the badging system, "…they can go into the computer lab or into another room and do homework during class if they finished their work already, and they don't have to have teacher supervision…Well, everywhere we go as middle schoolers, we have to have teacher supervision, so to be able to be in a room without a teacher is cool, because you don't have to be like babysitting…" The out-of-school benefits refer to field trips that students could earn related to the badging system.

The theme of rewards that we identified in the data relates to research connected to Cognitive Evaluation Theory. The literature on rewards is mixed and has shown to demotivating in some contexts. However, there is also evidence that externally motivated actions that are coupled with a participant's perception of autonomy, can lead to positive learning and engagement in a task (Skinner, Wellborn, & Connell, 1990; Grolnick & Ryan, 1987).

4.5 DISCUSSION

Table 2. Summary of Findings

Aspect of Interest	Evidence within the SBBS	Relevance to Badging Systems
Enjoyment and Independence	1. Students perceived badges as fun. 2. Students liked having choices in terms of the type and level of their participation.	1. Identify and maintain fun aspects of badges. 2. Allow participants to select a badge and the means to earn it.
Recognition	1. Students indicated a preference for badge-based recognition for work that extended beyond their typical academic activities.	1. Create badges that allow for recognition of skills or learning this is otherwise unrecognized.
Values	1. The novelty of the SBBS was attractive to the students. 2. The learning associated with earning a badge was seen as beneficial to short-tem and long-term goals.	1. Badge systems should reside outside of formal school structure. 2. Badge-based learning goals should have clearly identifiable benefits to students.
Personal Connection	1. The SBBS allowed for students to connect out-of-school activities with their academic pursuits. 2. Students chose badges that had personal relevance. 3. Student earned badges through methods that were selected based on appeal.	1. Badges should include non-school based pursuits. 2. Badges should have direct relevance to student interests. 3. Students should have the ability to choose amongst methods to earn a badge.
Rewards	1. Students valued rewards for earning badges based on the direct appeal of the reward. 2. Students indicated appeal of school-based and out-of-school benefits.	1. Badge rewards must be appealing to students. 2. Rewards should include school privileges and out-of-school benefits.

Our analysis leads to several takeaways. First, the evidence suggests that student choice is a notable piece of the SBBS in that it connected students' identities and students' sense of autonomy to activities and content. This type of connection has been an important design feature of constructivist learning environments (e.g. Krajcik, Blumenfeld, Marx, Bass, Fredricks & Soloway, 1998; Krajcik, Czerniak, & Berger, 2003) as well as informal learning environments (Allen, 2004). One can reasonably assume that the success of a badge system relies on forging this connection and that badge systems should identify and maintain the parts that are perceived as fun. Additionally, allowing participants to select a badge and the means to earn the same badge can further enhance interest.

In addition, our data suggest that the recognition that students receive from their experience in the badging system is also important to their engagement in the system. In this way, the recognition not only validated interests and activities students were doing outside of school, but also provided students with an opportunity to give extra effort and demonstrate their commitment to school-related work. This suggests that an important feature of the badging system is the opportunity to recognize the activities of students and the efforts that they give as they engage in those activities.

While the system has the potential to provide recognition to students, it also possesses values that are important to the students. These can be ephemeral like the fact that the system is new and different, or it can be something more tangible like the badge's ability to credential skills that are of long-term importance to the students. The implications of this for others who wish to implement such a system may be to capitalize on the novelty initially in order to garner early participation, but demonstrate the long-term benefit to students based on what is important to their future, such as for a job, or college admissions.

Our data also suggest the salience of the personal connection students were able to make to the badging systems activities. Many of the students described their choice of badges due to the fact that the badge related to who they are and what they do. In this way, students had ready access to the domain and saw the badging activity as an opportunity for self-expression (Nasir & Hand, 2008). This suggests the importance of integrating students' out of school activities as a way for students to reinforce their individual identity. However, it is worth pointing out that we do not know if the nature of this personal connection is to communicate one's identity to others or to reaffirm one's identity for the child him or herself.

Finally, the prevalent role that rewards played in the SBBS led to a final take-away. Students consistently reported rewards as an integral part of the SBBS. This prevalence of rewards is seemingly contradictory to other educational research findings related to rewards. Prior research indicates that rewards can have a negative effect on intrinsic motivation to learn (Deci, Koestner, & Ryan, 2001). Yet, students in the SBBS, while citing the importance of rewards related to their interest in participating, also never indicated that the reward supplanted their desire to earn a badge. Students seemed able to draw the distinction between the rewards and the badges, seeing rewards as an enhancement to the SBBS. Based on our findings, we conclude that appealing rewards is important to attracting participants in voluntary badge systems. Further, the blend of in-school and out-of-school rewards along with tangible and intangible rewards serves to ensure a broad range of appeal to students.

It is important to make note that while the focus of these findings is based on students who willingly participated, this only represented about half of the students in the sixth grade. Our analyses did not make contrasts between the interests and motivations of those who engaged in the system and those who did not participate. While this was a methodological decision in order

to better understand the motivations of students who did participate, this also limits our understanding of the overall landscape of students' interests and motivations to earn badges in school settings.

4.5.1 Future research

Because badge systems are still novel educational reforms, there is a dearth of knowledge regarding their use. Consequently, several specific areas of future research emerge from this study. First, we acknowledge that the small-scale nature of this study limits the inferences we can make to the broader population of students. For further study, we shall expand this study to other sites. This will enable us to make meaningful comparisons across sites as well as ascertain how representative our findings our. While our findings may not generalize to a broader population of students, the findings will enable us to generate hypotheses to further this work in the future.

In addition, expanding the study in the future would enable us to make comparisons across the different factors of student interest. This may enable us to understand the relative importance of the different factors as well as dig deeper into the factors. For example, we could further interrogate the notion of personal connections that students make with the badging system and whether or not that connection facilitates their identity making for others in their school or if this serves to reinforce one's own identity for him or herself.

Because our interviews were conducted at the end of the SBBS's first year of implementation, we are unsure as to how student interest changed over time. It is possible that the SBBS resulted in an initial singular boost in student interest that persevered over the course

of the year. Another possibility is that student interest increased and decreased during specific badges phases.

Another area of future research regards the effects on student interest as the SBBS enters its second year. Although all participating students reported a desire to continue their pursuit of badges, we do not know how badges systems affect the students' interest longitudinally. These effects may subside or, as we expect, could be compounded as more number of students choose to participate. This will be especially important to distinguish between the personal and situational aspects of the students' interests (Hidi, 1990).

A third area of future research is related to how rewards function with a badge system. It is unclear from our finding as to what are the effects of a reward structure for the long-term. As one student put it, "I mean, truly I think that the reason that most people are doing the badge is not because of curiosity and because we want to actually do it. Truthfully most people did it, including me, to get the reward. There are rewards that—like one of them is you take a field trip. I think for the Brin we go to Google headquarters or something. Then there's a lunch if you finish the badge. Then there are certain power ups for each badge that you can do." Further research is necessary to unpack this relationship.

Finally, while our findings do not make claims about the participating students' learning, investigating the connections that the system makes with students' interests is key to ultimately making sense of the participating students' learning. The various design features of the SBBS as well as our findings align with previous frameworks related to interest-driven learning (Edelson & Joseph, 2004). However, future research will need to focus on learning as well since we acknowledge the difference between students being motivated to engage in an activity and being motivated to learn within an activity (Edelson & Joseph, 2004).

4.5.2 Conclusion

The SBBS connects to students' interests in a variety of ways. In short, this connection is related to the fun the students experienced through the system, the greater independence it provided for the students, the ways in which students could distinguish themselves, the parts of the system that served needs that students had and valued, and the rewards that the system offered students. We hope that these findings can serve to lay the groundwork for future designs of badging systems in formal and informal educational settings as well as encourage empirical research toward current badging systems. While the thrust for badging systems in the field of digital media and learning currently is evident (Hastac Competition, 2011), we need research to assess the role these systems play in the learning and teaching enterprise.

5.0 TAKING BADGES TO SCHOOL: A SCHOOL-BASED BADGING SYSTEM AND ITS IMPACT ON PARTICIPATING TEACHERS

Badging is a recent innovation to support learning, learners' motivation and make public the accomplishments of learners. This innovation has primarily been implemented in informal learning and virtual settings—partially due to its lineage of being tied to the Boy and Girl Scouts and digital games. However, schools are beginning to imagine the potential badges could play in enriching the learning experiences provided for students.[9] While offering opportunities for re-organizing students' educational experiences, badging for learning also faces the challenges of other innovations that have been "brought to school."

This work addresses two areas of research related to badges that have yet to be developed. While the extent research literature on badging has primarily addressed badging in distributed digital environments, this study will describe a badging system in a school setting. In addition, although the current research on badging typically examines the relationship between badging and learners' motivation (Abramovich, Higashi, Hunkele, Schunn, & Shoop, 2011;

[9] At the time of writing this, I was unable to find a peer-reviewed study of badging in schools nor was I able to find a white paper or report addressing this issue. However, there are numerous web site pages and blogs that refer to badging in schools, e.g.
http://www.learningtimes.com/what-we-do/badges/digit-badges-nycdoe/ ;
http://tamritz.org/category/badge-learning/ ;
http://www.edc.org/newsroom/articles/pursuit_mastery

Abramovich, Higashi & Schunn, 2013; Ahn, Butler, Alam & Webster, 2013), this study will describe the impact of a badging system on the teachers facilitating the badging process.

The findings of this study come from a school-based badging system in its second year of implementation. These findings are drawn from a qualitative analysis of interviews of participating teachers, the principal, and students, as well as a review of badge-related documents at the school. The analysis applied a conceptual framework to address the ways in which the badging system provided teachers new information about students, the ways in which the badging system encouraged collaborative activity among teachers, and the ways in which it impacted the participating teachers' instructional practice.

There are several noteworthy findings from this study. First, the data suggest that the badging system did provide teachers with new information about students not readily available through their typical school-based interactions. This information included students' interests and strengths as well as challenges students face outside of school. Also, while the badging system initiated new meetings and opportunities for joint work, the data do not suggest that these collaborative activities established a public practice of instruction for the participating teachers. Finally, most of the teachers did not acknowledge changes in their instructional practice related to their participation in the badging system.

While this is a small-scaled study, these data offer implications for future school-based badging implementations. First, these data suggest that a badging system could be an element of an information infrastructure of teachers to support data-informed instruction. Explicitly accounting for student information in future designs could make teachers more aware of what they are learning about students. In addition, to realizing the potential of teacher collaborative work around the badging system, future designs ought to consider norms of collaboration, such

as protocols, to facilitate joint work. Finally, while the badging system presented the teachers with new elements of instructional practice, such as technological tools, rubrics and disciplinary practices (like information literacy), future designs ought to take into account and support the chance for new instructional practices to emerge through such means as coaching and opportunities for reflection.

5.1 BACKGROUND ON BADGES FOR LEARNING

Badges have a long history of documenting accomplishments (Halavais, 2011). A current prominent way of defining badges as proposed by the Mozilla Foundation is "… a symbol or indicator of an accomplishment, skill, quality or interest" (Open Badges White Paper, 2011). In general, badges are public representations of what one has learned, accomplished and experienced (Gibson, Ostashewski, Flintoff, Grant, & Knight, 2014; Plori, Carley, Foex, 2007). In this way, badges are visible to others. While much of the literature on badges characterizes them as digital or inhabiting digital spaces, badges can be both digital or tangible (Halavais, 2011). In fact, the most common referents for badges in communicating what they are is the tangible, merit badges that are rewarded to scouts of the Scout Association,[10] the Boy Scouts of America[11] and the Girl Scouts of America.[12] In turn, the scouts have been influenced by the use of medals within the various branches of the military.

[10] http://scouts.org.uk/what-we-do/badges-and-awards/
[11] http://www.scouting.org/meritbadges.aspx
[12] http://www.girlscouts.org/program/basics/for_volunteers/where_to_place/junior

Another perspective on what badges are comes from Montola and colleagues (2009). In their brief study of implementing achievements with a photo sharing web application, they define achievements as " …secondary reward systems that have been developed for digital games" (Montola, Nummenmaa, Lucero, Boberg, & Korhonen, 2009; p. 94). These rewards represent deeper levels of engagement and experience as more badges are earned (De Paoli, De Uffici, & D'Andrea, 2012). In this way, they are viewed as optional reward structures that can scaffold a users' direction through a game.

The work of Montola and others situates badges as an example of gamification. In this way, badges are sometimes considered a game mechanic and some game designers view badges as an example of gamification (Deterding, Dixon, Khaled, & Nacke, 2011; Zichermann & Cunningham, 2011). Gamification is defined as the use of game mechanics and other elements of game design that are used or designed in non-game situations (McGonigal, 2011). Game mechanics therefore shape participants' experiences in games. Taken within this context, badges would be thought of as a way to shape the way a player plays a game. Ultimately, badges provide a tangible or digital representation of what a badge earner has done (Frederiksen, 2013).

5.1.1 Taking badging to school

Implementing a badging system in a school represents an innovative effort to positively influence student learning. In general, efforts to innovatively improve teaching and learning in schools have a checkered history. As Ann Brown has written, that "… successful interventions are a chimera or at least are extremely fleeting and fragile, not readily transportable to settings outside the innovator's control" (1992, p. 172). This is especially true with respect to technological innovations (Gomez, Gomez & Gifford, 2009).

Ultimately, innovations fail to impact the "core technology" of schools, which is classroom teaching and learning (Hawley & Valli, 1999). This core technology has been further specified for schools as the "instructional core," or the interrelationship between teaching, the content and student engagement (City, Elmore, Fiarman, & Teitel, 2009). The success of our program of work, or any school improvement effort, is intimately tied to the instructional core. As City and colleagues write, "If you can't see it in the core, it's not there" (City et al., 2009, p. 4).

Yet, like a badging system, we can look to Project-based Learning (PBL) as an innovation that impacts teaching and learning in schools. PBL is a useful example for at least two reasons. First, Project-based Learning demands that teachers and students engage in new and different classroom practices that are not easily achieved (Krajcik, Blumenfeld, Marx, & Soloway, 1994). Second, similar to badging systems, PBL seeks to provide students with a degree of independence that is not often afforded in school and connect real-world applications with in-school learning.

PBL is an instructional approach that organizes learning around the doing of projects (Barron & Darling-Hammond, 2010; Maxwell, Bellisimo & Mergendoller, Thomas, 2000; Savery, 2006). According to Markham, Larmer and Ravitz (2003), PBL is

> "…a systematic teaching method that engages students in learning essential knowledge and life-enhancing skills through an extended, student-influenced inquiry process structured around complex, authentic questions and carefully designed products and tasks" (p. 4).

While precise definitions of PBL vary (Barron & Darling-Hammond, 2010; Grant & Branch, 2005) and appear under a variety of names, (Mitchell et al., 2005), PBL attempts to engage student learning through a constructivist learning environment (Blumenfeld, Kempler & Krajcik, 2006; Kravitz, 2010). This learning environment often includes a driving question, and collaborative learning activities that are product-centered and connected to the world outside of the school classroom.

While the implementation of project-based learning has documented successes in schools, such as increasing the implementation of projects by teachers (Blumenfeld, Kempler & Krajcik, 2006) and gains in students' performance on assessments (Geier et al., 2008), there have also been many challenges to the implementation of projects. As Barron and colleagues stated, "A major hurdle in implementing project-based curricula is that they require simultaneous changes in curriculum, instruction and assessment practices—changes that are often foreign to the students as well as the teachers" (1996, p. 306).

Through the practical experience implementing technology rich, project-based learning experiences, Blumenthal, Fishman and colleagues in the Letus project developed a framework for assessing the usability or "fit" of innovations within schools (Blumenfeld, Fishman, Krajcik, Marx, & Soloway, 2000; Fishman, Marx, Blumenfeld, Krajcik, & Soloway, 2004). In their approach to scaling project-based learning as an innovation in schools, they viewed capability, culture, and policy and management as being key indicators for success. Capability refers to the ability of teachers and administrators to competently carry out the work necessary for the innovation's impact to be realized. This might include teachers' enactment of new modes of assessment or having the content knowledge to guide students' generation of meaningful questions (Krajcik et al., 1998; Marx, Blumenfeld, Krajcik, & Soloway, 1997). Culture refers to

the individual and collective beliefs and practices that the teachers and staff adhere to, and the extent to which a school's cultural elements support or hinder an innovation. Policy and management refer to the structures and conditions created by both in school leadership as well as district and regional leadership that support or hinder an innovation.

While the framework for scaling innovations does not serve as an analytic tool for this study, it further suggests that innovations in school depend to some extent on the facilitation of teachers. The conceptual framework that I will describe in the next section fits along the lines of capacity and culture. This prior research on Project-based Learning suggests that the productive implementation of a school-based badging system will demand supportive teacher capacities and practices that are in-turn supported by policies established in the school. In what follows, I will establish the conceptual lens that guided this work.

5.2 CONCEPTUAL FRAMEWORK

The conceptual framework to examine the school-based badging system is based on three conjectures. These conjectures are drawn both from general trends in instructional reform as well as reasonable features of the badging system that align to these reforms.

- The badging system provides teachers with new information about students that may guide their support of students.
- The badging system provides teachers with new social arrangements to support collegiality and professional community.

- Teachers' involvement in the badging system supports changes in teachers' instructional practice.

First, it is worth noting that this conceptual framework explicitly directs the lens of this implementation on the teacher. This is intentional. While Blumenthal, Fishman and colleagues point out the importance of other elements for implementation and scaling of innovations (Blumenthal et al., 2000; Fishman et al., 2004), there is reason to focus on the role of the teacher. First, teachers go to the heart of the Letus model that takes into account capacity and culture. Second, while many badges are allocated in online systems through the moderation of users (Anderson, Huttenlocher, Kleinberg, & Leskovec, 2013; Kriplean, Beschastnikh & McDonald, 2008; Oktay, Taylor & Jensen, 2010) or through the execution of a game system (Bjork & Holopainen, 2005, Moore, 2011), as badges are implemented within place-based learning settings—as the current philanthropic environment suggests it will—it is useful to understand how teachers are involved with the system. I will describe the rationale for the three conjectures below.

- *Conjecture #1:* The badging system provides teachers with new information about students that may guide their support of students.

An emerging body of research on data informed instruction suggests that using student data may be important for instructional and school improvement (Hamilton et al., 2009; Halverson, 2010; Mandinach, 2012; Marsh, 2013; Wayman, Cho, Jimerson, & Spikes, 2012). As an intervention, the badging system presents a choice-based learning environment for students:

students choose to participate in the badging program, they choose the badge they intend to earn, and they choose the task or activity with which they may demonstrate their skill or competency in this work. These choices can potentially reveal such things as students' interests, aspirations and talents that may not be visible to teachers through their typical classroom interactions. These qualities of students may be visible through student work as well as through the participating teachers' interactions with students through their role of monitoring each student's progress and guiding students through the process of earning a badge.

However, despite the conditions created for students exercising choice and interacting with teachers does not ensure that teachers will glean new information about students. Being attuned to student information and more importantly, being able to think about that information instructionally, i.e. translating that new information for instruction has been seen as a challenging pedagogical skill and one that needs to be explicitly fostered (Mandinach, 2012; Mandinach & Gummer, 2013; Mandinach & Johnson, 2013;).

Conjecture #2: The badging system provides teachers with new social arrangements to support collegiality and professional community.

School has long been characterized as being isolating teachers (Lortie, 2002). However, research for the past twenty years has suggested that de-privatizing instructional practice and building professional communities of teachers can be important for school improvement (DuFour, 2004; Grossman, Wineburg & Woolworth, 2001; Louis, Kruse & Bryk, 1995; McLaughlin & Talbert, 2001; Stoll et al., 2006). One way that professional communities have been intentionally developed is through a focus on student learning (Louis, Kruse & Bryk, 1995)

and through shared collaborative practices directed on that focus, such as looking at student work through critical friends groups (Little, Gearhart, Curry, & Kafka, 2003), teacher protocols (McDonald, Mohr, Dichter, & McDonald, 2013), or lesson study groups (Lewis, Perry & Murata, 2006).

Aside from the fact that a cadre of teachers would be working on the badging system, which offers a common activity around which teacher professional community could form, there are features of the badging system that suggest teacher collegiality may be impacted. Similar to other reform programs, the badging system's implementation included regularl monthly meetings for the participating teachers to come together. Second, participating teachers were paired to a particular badge to serve as the facilitator of the badge for students.

Focusing on teacher collegiality for the innovative program implementation is not only important to address because of its importance to program effectiveness, research suggests that building professional community and collegiality within schools is complex (Moller, 2006; Supovitz, 2002; Wells & Feun, 2007). This is due, in part, to inhibiting factors such as the organizational structures of schools (Bryk, Sebring, Allensworth, Easton, & Luppescu; Kruse, Louis, & Bryk, 1995), the culture of schools (McLaughlin & Talbert, 2006), and the beliefs of teachers with respect to collegiality and public display of teaching (Darling-Hammond & McLaughlin, 1995; Thompson, Gregg, & Niska, 2004), all of which impact the extent to which a professional learning community and teacher collegiality builds within a school.

Conjecture #3: Teachers' involvement in the badging system supports changes in teachers' instructional practice.

As innovative programs are presented into schools and ask of teachers to work differently, they can provide embedded learning experiences for teachers (Bakkenes, Vermunt, & Wubbels, 2010). Therefore, understanding how a new program, tool or activity impacts the instruction of teachers directly and indirectly can be useful. In the case of multi-faceted interventions like Project-based Learning, the impact on teachers' instruction can be multi-faceted (and not entirely clear from the beginning) such as their assessment practices, classroom management, or content knowledge (Blumenfeld, Kempler & Kracjik, 2006). In addition, if combined with reflective experiences, the enactment of new instructional approaches can serve as productive opportunities for teacher learning (Clarke & Hollingsworth, 2002; Shulman & Shulman, 2004; Tynjala, 2008).

The impact of an innovation in schools on teacher practice is elusive though. While some studies attribute this to teachers misunderstanding a reform program (Cohen, 1988) or acclimating the innovation within their own mental models (Spillane, Reiser & Gomez, 2007), the hard truth may be that those in the classroom may be on a path of change that takes time. This is true for teachers (Messina, 2001; Simon & Tzur, 1999; Shulman & Gamoran Sherin, 2004) as well as students (Bielaczyc & Blake, 2006; Herrenkohl & Mertl, 2010).

In summary, this study conceptualizes the role of the teachers in the implementation of a school-based badging system through three categories of impact. This includes gaining new information about students, working with colleagues, and experiencing changes in instruction. In the next section, I will describe the setting of the badging system implementation and the design of the study.

5.3 METHODS

5.3.1 Description of a badging system

The badging system at the School is still a work in progress. Therefore, this description of the badging system encompasses the elements of the badging system that existed during the two years of implementation that this study investigates. In describing the school-based badging system (SBBS), it is worthwhile to note my intentionality of referring to the system instead of simply the badges. Similar to what Cobb and Jackson refer to as an instructional system (2008), there are tasks, activities, tools, and discourses related to badges that are interdependent and together constitute the system. These are important to consider since this implementation does not simply include the awarding of badges, but also designed milestones and meetings between teachers and students that are intended to scaffold students along the way to earning their particular badge.

The SBBS was designed to support the development of what Henry Jenkins cites as the necessary skills for the 21st century's participatory culture (Jenkins, 2009). Specifically, the targeted skill set includes skills that are useful both in and out of formal education environments and that rely on mastery of digital media. These skills are considered important for future success even though they are not traditionally part of formal educational curricula.

5.3.2 Badge learning goals

The specific learning goals were reflected in four different types of badges: information literacy, collaboration, acceptance, and empowered learning. Each of the badges was named after a

prominent Jewish professional in a field related to the badge. In figure 5, we can see a picture of a public display promoting the badges and directly identifying the badges with the figure attached to the badge.

Figure 5. School display of the badges in year 1

The learning objectives provide general descriptors of what the students will be able to do to demonstrate competency for each badge. In table 3, we can see the four badges from the first year of implementation and the associated learning objectives for each one.

Table 3. The Initial Four Badges in the System

Badge Name	Learning Objectives
(Sergey) Brin Informational Literacy Badge	Badge earner demonstrates ability to identify the need for information, use effective strategies to seek out information, parse significant information from less significant information, critically evaluate the credibility of information, and synthesize information from multiple sources.
(Elana) Kagen Empowered Learner Badge	Badge earner demonstrates ability to learn independently through preparation, self-assessment, skill assessment, and perseverance.
Elie (Wiesel) Acceptance Badge	Badge earner demonstrates ability to recognize one's values and beliefs, successfully negotiate a shared understanding with and fair treatment of those different from oneself, and standing up for targets of prejudicial treatment.
(Ruth) Messinger Collaborating Badge	Badge earner demonstrates ability to collaborate within a group to develop creative solutions to complex challenges by employing the resources at hand and assuming varied roles while considering divergent points of view and negotiating for mutual benefit.

5.3.3 Phases to earning a badge

Students selected a badge and were then, over the course of the school year, asked to supply evidence indicating completion of three distinct learning phases: **Recognize It, Talk About It,** and **Do It**. In the first year of implementation (2011-2012), students began selecting and working on badges in January of 2012. In the second year of the implementation (2012-2013), students began selecting and working on badges in November of 2012.

The **Recognize It** phase required students to indicate understanding of the targeted skills of their selected badge. The **Talk About It** phase required students to show evidence of their ability to communicate effectively about the badge. The final phase, **Do It**, asked students to supply evidence of their mastery of the badge content. Each student's evidence was compiled into a digital transcript that served as a record of his or her badge progress. In Figure 6, we can see the digital transcript. Each triangle represents a potential competency space. As a student completed each piece of the badging process, for example the **Recognize It** phase, a corner of the triangle for the competency would be filled in. When all three corners of the triangle are filled in, this signifies that the badging process is complete and the student has earned the badge.

This digital transcript was developed with the help of Global Kids and was refined based on an earlier implementation that they had in a New Orleans school (Global Kids, 2010). Since the first year, the school has moved away from the notion of the digital transcript in practice, but the use of the three stages of earning a badge, recognize it, talk about it and do it, are still very much part of the program.

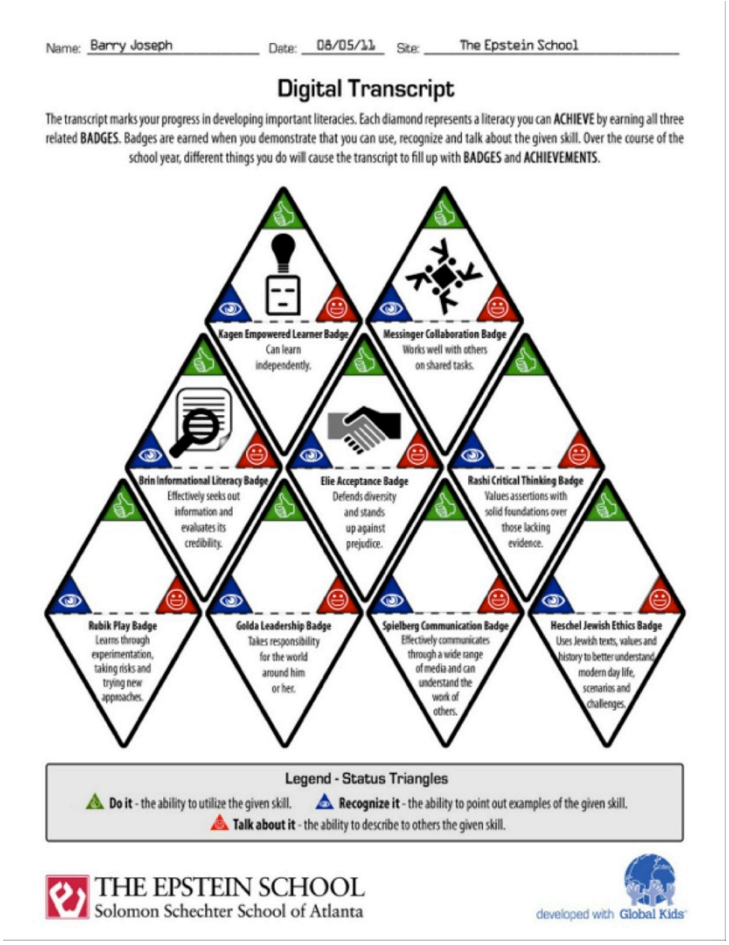

Figure 6. Digital transcript

The school's teachers served as determiners of the quality of the evidence and whether a student passed each badge phase. To support the badging work, the teachers received approximately 160 hours of professional development collectively during the Spring of 2011—the school year preceding the first year of implementation. In order to determine the quality of evidence that the students exhibited to demonstrate their achievement of a badge, the student would schedule and meet with a teacher and their work would be assessed with respect to the particular badge's rubric. I have included an example rubric in appendix one. While the majority

of student-teacher interaction was face to face, there was also an online platform intended to further encourage student sharing of work and teacher feedback. For a variety of reasons, this platform was not used extensively and therefore all of the interactions were not analyzed. However, in figure 3, we can see the general interface showing how students could share work and teachers could offer feedback.

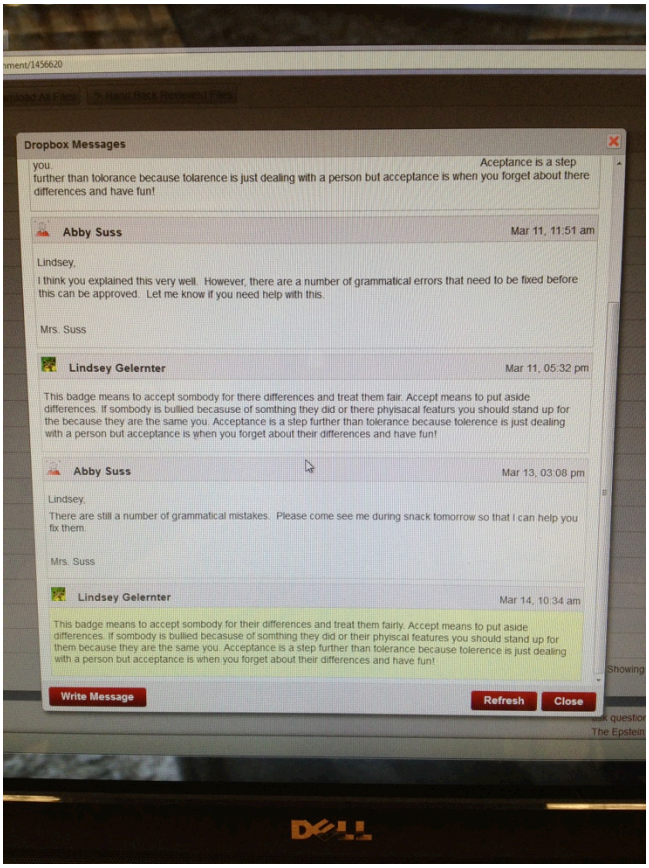

Figure 7. Screenshot of online platform supporting student and teacher interaction

For example, in Figure 7, the teacher, Mrs. Suss tells a student, Lindsay, that her explanation was sufficient, but she had grammatical errors in her explanation. They arrange a meeting during the next day's snack time.

5.3.4 Badge-related rewards

Upon completion of each badge phase, students were rewarded for their success. The rewards included ceremonies where students received an indicator of their accomplishment in the form of a wearable badge. In Figure 5, we can see an example of the actual badge. The badge says, "Badger at Work" with an accompanying picture of a real badger. The badge can be worn around a student's neck to publically recognize their work.

Figure 8. Tangible badge earned by students

Non-tangible rewards were also associated with earning badges. These rewards were called power-ups. The power-ups included additional in-school privileges such as unsupervised computer time or the ability to leave a class to work on completing the next badge phase. Unsupervised computer time in the school's computer lab is not the norm at the school and

therefore represents a unique privilege afforded to badge earners that is not available to students who do not earn badges. Upon most participants' completion of their badges, which coincided with the end of the school year, badge earners would get an exclusive catered lunch and a fieldtrip related to their badge. For example, those students who earned the Informational Literacy Badge were promised a trip to the local office of Google and this trip was carried out at the beginning of the second year. It is important to note that participation in the badging system was entirely voluntary and incompletion of a badge contained no repercussions besides lack of reward.

5.3.5 Badge system design

The badging system was co-developed by faculty, staff, and students at the school in partnership with Global Kids, Inc., a leading non-profit educational organization for global learning and youth development. Global Kids, Inc. works to ensure that urban youth have the knowledge, skills, experiences and values they need to succeed in school, participate effectively in the democratic process, and achieve leadership in their communities and on the global stage. Global Kids, Inc., prior to working with the school, had developed badging systems for a Jewish Day School in New Orleans and after-school programs. Consequently, the school-based badging system has certain core features similar to other Global Kids, Inc.-created badging systems. For example, the design of the SBBS included student participation. Similar to prior Global Kids, Inc. badging systems, specific students were selected by the school administration to form a badging committee during the summer before the first year of implementation and asked to offer their opinions and suggestions during the initial design of the badging system. Other features that

the badging system shared with prior Global Kids, Inc.'s efforts included the distinct phases toward badge completion and the use of digital transcripts.

Other features of the badging system were designed based on the independent school's mission of Jewish education. The school integrates Jewish values into its curriculum, instruction, and facilities and, consequently, certain features of the badging system were also designed to integrate specific Jewish values. The badges were named after famous Jewish individuals who were selected based on their appropriateness to the badge learning goals as well as suitability as role models. We can see this in Table 3 where Sergey Brin, one of the founders of Google, is associated with the information literacy badge. The badges were all designed to be compatible with Jewish values as well as to allow for integrations with specific Jewish curricula such as Hebrew Language or Judaica.

In addition to these aspects of the design of the system, administration and teacher participation were key to the badging system's implementation. The SBBS had the support of both the head-of-school and the middle school's principal. Specific teachers were given the task of both participating in the design process and also the daily implementation of the badging system. The teachers' vigilance, in spite of several challenges of implementation, was crucial to the badge system's functionality.

Consequently, the SBBS provides an appropriate case to explore my research questions: what is the relationship between a badging system and participating students' interest-based learning, and in what ways did the badging system provide new, actionable student information for teachers?

5.3.6 Setting

The school where this research takes place is located in a suburban metro area in the Southeastern United States. The school is a religiously based school that integrates Jewish themes and values into core content classes as well as offering separate classes related to Jewish history, culture and the Hebrew language. The school services approximately 600 students in grades PK-8. This study in particular focuses on sixth and seventh grade students—the grades that were implementing the badging system.

The student population is homogenous in that 100% of the students identify as Jewish. While public test data and demographic data are not available, it is worth noting that many of the students were from high socio-economic backgrounds. This was alluded to by some of the teachers we spoke to and it is also reflected by the fact that the school is a tuition-based school costing approximately $19,000 a year for sixth and seventh graders' attendance.

The teachers interviewed in this study ranged in experience from 4 years of teaching to over 25 years of teaching. While the teachers all claimed to voluntarily take part in the badging system, many of the teachers in the school do not teach full time and it is not uncommon for the teachers that many of the teachers pick up extra responsibilities whether it be running a club, coaching, providing homework help or maintaining a homeroom. Despite many of the teachers being less than full time, turnover in teachers from year to year is approximately 8%.

It is worth mentioning that the setting provides some useful affordance as well as limitations for these studies. First, it presents an early opportunity to study an implementation in a badging setting. This was obviously important for my research. Second, as an independent school, this implementation provided some ideal aspects of infrastructure with respect to technology. By this, I mean that there was a technology teacher who was one of the co-leaders of

the implementation. The school is adequately equipped with computers, and there is an additional person at the school who is in charge of IT support leaving the technology teacher available for supporting teachers and students' use of educational technologies, both in a teaching role and a coaching role.

In addition, since the school is a private school, the students are predominantly affluent with engaged parents. The teachers informally remarked to me about the parent involvement as being great. And I observed a sixth-grade parent meeting that took place during the day that was attended by 42 parents and/or guardians. The parents have chosen to send their children to the school and the school is not obligated to keep students from year to year if the students are not reaching the behavioral and academic expectations of the school. In this respect, the school's students represent a potentially more motivated school population than the average school.

It is not fair to characterize the site selection as purposive since there were not additional sites available from which to select. At the time of the study, I was not aware of any other school site implementing a badging system. Nevertheless, taking into account the fact that the school site is not typical for schools, this site serves as an existence proof (Magidson, 2005). This badging system represents an attempt at implementation within a school setting and provides the opportunity for me to investigate student motivation for badges and how student participation may have provided teachers with actionable information. In this regard, as an existence proof, this implementation provides a clear opportunity to investigate these aspects within an appropriate setting. In this regard, existence proofs have been thought of as appropriate first steps in studying how curricular innovations operate in school settings (Brown, 1992).

Despite these affordances of the study site, I am well aware of what the study site limits in my findings. Certainly, the site selection limits what the findings generalize to. The study site

is not typical of schools across the United States. While generalizability is not a goal of this study or the design of the study, these findings enable hypothesis generation that I and other researchers can apply to future studies that can be modified based on the specific site selection. In this way, the study provides empirical evidence of student and teacher participation with a badging system in a school setting, which were the phenomena of interest. To this point, no other study has reported findings from a school-based badging system that I am aware of.

5.3.7 Teachers' work and the badging system

Teachers voluntarily selected to participate in the badging system. However, it is important to note that there are some reasons to question the totality of the teachers' decisions for two reasons. First, the teachers all said that they were asked to participate in the badging system program. And second, they were asked either by or at the request of the principal. While this is not an aspect of the analysis, this is an important contextual detail to note about the program that it was implemented by volunteers or semi-volunteers.

Participation for the teachers meant that there were several commitments. First, two teachers were assigned to a badge and they were supposed to work together in their support of the badge earners' process. To support the badge earners' process, the teachers would together or separately meet with students to shepherd them through the Recognize It, Talk About It, and Do It phases that were mentioned above. Each of those phases served as milestones for earning the complete badge and the students were dependent on the teacher allowing them to move on. This was facilitated by the students providing evidence to match the criteria within the rubrics of each milestone. As we will show in our data, the teachers supported the badge earners through email

or online interactions as well as face to face support. The school organized monthly meetings after school for the teachers participating in the badging system.

5.3.8 Data

For this study, I drew primarily on interview data with teachers. In the first year of data collection, we piloted a teacher interview protocol to explore the extent to which the badging system was providing teachers with useful information about students and the ways the badging system may have impacted their instruction. These pilot interviews were carried out with six participating teachers. These initial teacher interviews were transcribed and analyzed to identify salient themes that were emerging from their responses. These analyses served to inform a revised, semi-structured interview protocol for the participating teachers.

Members of our research team interviewed eleven of the sixteen participating teachers one-on-one. Two of the teachers were not selected for an interview because their badge did not have any participating students. The other three teachers were not available on the days we scheduled the interviews. These interviews took place during a three-day period in the Spring of 2013. The interviews took place in school offices or empty classrooms during the teachers' non-instructional periods. I additionally interviewed the principal after all of the teacher interviews were completed. The interviews averaged approximately 45 minutes in length. While taking the approach of gathering interview data from teachers does not afford the opportunity to get a granular perspective of their instruction, interview data could afford the chance to identify big changes in instruction, collegiality and new student data, which may serve to guide future studies where to probe for more detailed influences of badging on teaching.

The data that are used in this study to address the three conjectures are seen in the table below. School documents refer to the documents generated by the school to communicate the badging system to students and teachers as well as documents produced by Global Kids, the technical assistance partner for the school. These data served to provide important contextual information about the badging system, such as the elements of the rubrics. Teacher and staff interviews refer to the interviews with the teacher and staff who are directly involved in the badging implementation. A longer principal interview (~1hour) provides an additional check on the teachers' description of the badging implementation.

Finally, our research team conducted interviews with 29 students. Twenty-one of these students were students who were currently earning (or recently had earned) a badge at the time of the interview. The other eight students interviewed were students who had earned a badge in the previous year, but did not choose to earn a badge in the current year. The primary purpose of the student interviews was to continue a line of inquiry related to the student's motivations to earn a badge. The student interview served to provide additional context to teachers' statements about meeting with students and the students' perspectives on the teachers' support for earning a badge.

Table 4. Crosswalk of Data to Address the Study's Three Conjectures

	School documents	11 Teacher / Staff Interviews	Principal Interview	Student Interviews
Conjecture 1		xxx	xxx	xxx
Conjecture 2	xxx	xxx	xxx	
Conjecture 3	xxx	xxx	xxx	

5.3.9 Analysis

The analytic process began during the data collection. After each day of interviews, the four researchers facilitating the interviews wrote analytic memos to identify themes from their interviews as well as document their impressions and assumptions generated from the interviews. These analytic memos enabled me to clarify the dimensions of the coding categories (Corbin & Strauss, 2008). The memos served to refine the conjectures based on the data, for example, fundamentally questioning if and how the badging system was providing teachers with new information. These analytic memos were shared among the researchers and I discussed the memos with the researchers each day. All of the interviews were digitally recorded and transcribed verbatim.

Interview transcripts were uploaded to Dedoose. I read through all of the transcriptions first and then began coding. The coding schemes were developed based on a grounded approach. Based on several reads of the transcripts of the interviews and discussions with the researchers, I developed thematic categories to organize the kinds of new student information the teachers were claiming to know, how the teachers talked about moments of collaboration and how the teachers perceived their instruction to be impacted.

Using a constant comparative method (Corbin & Strauss, 2008), I re-read the transcripts to find disconfirming data and revised the codes based on these additional readings of the data and weekly discussions with the research team. With each subsequent coding of the data, I recorded my coding and inferences in analytic memos (see example in the appendix). In parallel to the coding process, I was engaged in discussions with the research team. These discussions served as chances to test out my codes and the inferences drawn from the codes with the research team. In addition, two other researchers independently coded a set of three transcripts, and

enabled me to discuss my own coding with those researchers. All of the coded transcripts were available to all of the researchers. Once the data were coded, I consolidated the analyses into an organizational structure for writing the paper.

I sought credibility in our analysis through a number of strategies (Lincoln & Guba, 1985). First, I sought to maintain methodological consistency through our data collection and analysis (Morse et al., 2002). Therefore, our data and analysis were aligned with our research question and theoretical framework. This was not intended to constrain our analytic process but to ensure a "trustworthiness" (Lincoln, 1995) in that my point of inquiry, analytic approach, and analysis were carried out systematically and as intended. Second, I maintained regular open and critical discussions of our analysis within the research team. This allowed me to share my codes, challenge my analyses, and refine my own coding definitions to reach a common understanding for our group. When consensus was not immediately reached, I brought to bear additional examples from the data for discussion and the coding category was refined until consensus was reached.

Third, as part of the research team, I shared a draft report with the funder, the principal and the participating teachers. While this report contained findings about the students as well as the teachers, findings about the teachers similar to those presented here were included in the report as well as additional teacher-related findings.

5.4 FINDINGS

Overall, data suggest that the badging system does provide teachers with new information about students that was not readily available to the teachers. This new information consisted of

students' strengths that exist outside of school, teachers' learning about difficulties that students faced in trying to be successful in school and students' interests outside of school. In general, these findings suggested that the badging system afforded teachers with a window into students' lives that was not previously available.

The data suggest that the badging system provided limited impact on the teachers' collegial interactions. While the teachers spoke about the regular monthly badging meetings, there were not substantive examples of teachers engaged in such aspects of collegial work as de-privatizing their practice or discussing student learning. Also, some teachers remarked that teachers worked around each other at times rather than together to support the badge earners within their assigned badges.

Finally, there was very little evidence that the badging system had influenced the teachers' instructional practice. In fact, almost half of the teachers stated that their experience with the badging system had not impacted their instruction. However, there was some evidence of teachers using new information about students that they had learned for instruction. Also, two teachers speculated how the badging system could impact their instruction in the future.

5.4.1 Teachers' learning new information about students

Three general themes characterize what teachers learned about their students. First, teachers were able to see students' strengths that may or may not have existed outside of school-related work. Second, teachers were made aware of what difficulties students faced in trying to be successful in school. And third, teachers were made aware of previously unknown students' interests. Ultimately, teachers suggested that the badging system afforded them the opportunity to gain a more complete understanding of their students.

5.4.2 Students' strengths

Teachers discussed the ways that students' badging work enabled them to recognize students' strengths. For example, one teacher stated,

> "I think there's definitely kind of those techie students, if you want to put it that way, that perhaps in my classroom, because—we do use some [content related work], but because it's mostly hands-on and we're still doing [skill related work] and things, I've seen those students, their strengths, where maybe I wouldn't have realized that that was a strength for them had I not been involved in badges."

In this case, the teacher is noting that some students are not able to demonstrate just how capable they are with technology within the regular constraints of classroom instruction. However, the opportunity of earning a badge does enable the students to show additional capabilities. Or as another teacher stated, referring to a students' badging work,

> "...but it's something that a teacher or somebody looks at and says, wow, you really did something on your own. This had nothing do with requirements. I see you have earned these badges."

Because of the badging system, students were able to show their teachers facets of their identity beyond specific skills. One teacher hinted that she was able to see beyond the persona that a student takes on in the classroom.

"I think for this one kid—this one [student] in particular who can be annoying because [they are] looking for attention and [they want] to be—[they've] got some anxiety and some rigidity to [them]. The teachers are able to see outside of just that scope of [the student] and they're able to see more of it."

This quote suggests that the teacher can see more of whom the student is than simply how that student acts within the classroom.

Similarly, another teacher talked about how their interactions with a student who was earning a badge allowed the student's creative talents to shine in ways that the regular classroom environment does not enable.

"...like I said, you see one side of students, and you're getting to know them at the same time. For example, [the student] sometimes has a few impulse control issues, which—but to be able to see the positive side of some of [the student's] impulse control issues and to see [their] creativity."

5.4.3 Students' difficulties

Teachers also noted that they were able to gain new understanding about difficulties that students may be facing that are outside of their regular class work. For example, one teacher noted about a group of students that they had a difficult time working together. By seeing the rubric for the collaboration badge and gaining a language for what constitutes collaboration, she could see that students were not equipped with this skill in her class. She said,

"I realized they really—they have a very hard time collaborating. I see them

now. I can remember this one child that really gave up. I know why that child gave up, because I see what [the child]—not that I knew it so much, but I see now. I thought, that showed me that's a very hard thing for [that child] to do. I'm a little sorry that I really didn't just walk [the child] through it 'cause I think it would have been good for [that child].”

In this response, the teacher highlights the fact that they were more aware of the challenges students were facing in class based on their involvement with the collaboration badge. This suggests that the teacher was interpreting their students' classroom behaviors by specifying what constitutes productive and collaborative learning behaviors as part of the collaboration badge.

The badging system also provided some teachers the opportunity to recognize how busy their students are outside of school.

“They're just busy. They're incredibly busy. Just like just now, you asked me what I do here and I say all the things I do. Kids are the same way. What do you do? It's a long, long list. I think that's the biggest thing that I've learned about the kids is that they're incredibly busy.”

“It's like, they went to three bar and bat mitzvahs. They had a dance recital. I guess just things—just it's that they're really, really, really busy. It is amazing that some of these kids can actually do the badge thing and not—on top of everything because of the fact that—I don't know. I don't know. It just seems like they are—

> they're just busy. I don't know. That's kind of the biggest thing that I've taken away from it, I guess."

It is not surprising that students are extremely busy meeting the demands of in school and out of school commitments as well as family and social commitments. However, these quotes suggest that some teachers may not be aware of this fact. The addition of the badging system in the students' lives not only offered teachers an opportunity to learn this, but potentially also tipped the scales in the students' time management.

5.4.4 Students' interests

Teachers noted that the badging system created new opportunities to learn about students' interests. Teachers attributed this to the fact that, in class, they are focused on the curricular and learning goals of instruction. As previously mentioned, teachers often are not able to learn about their students outside of classroom work. One teacher shared this anecdote about a student,

> "There's a synagogue here called [Synagogue Name] that was set up originally to cater to gay and lesbian couples, although it now kind of caters to everybody and gay and lesbian couples are included in their membership, but it's not solely for them. [A student] talked a lot in it about—in [their] thing, [they] talked about how [they] had gone to this synagogue once maybe just for a bar mitzvah or something like that and how the topic had really interested [them] and how [they] became—after this experience, [they] had become very passionate about equal rights for all and things like that. It was an interesting—it's not something that would have come up in [content area] class."

In this example, the teacher is sharing what a student chose to work on for their badge. It is not clear if the student's passion about equal rights for all existed prior to the badge work or was catalyzed by the badge work. However, as the teacher makes clear, this topic would not have come up during their content area class.

In a somewhat different way, another teacher shared how a small community of students sharing the same interest was catalyzed by their involvement in badges. The teacher stated,

> "We've also found a group—just as an aside—of 'Doctor Who' fans, which may not sound very important to you, and it's really not part of badging except that they sort of found each other through these nerdy interests in badges. Now we have a group of kids that aren't in the same section of language arts, and includes an eighth grader who's sort of a little bit of an outsider, who all get together to discuss 'Doctor Who'. It's a little group of geeks, but they discovered each other through sort of play and this common interest in doing these other things. Now, I get to discuss 'Doctor Who' with them one lunch period a week just for fun because that's what they enjoy doing."

This quote is noteworthy for at least two reasons. First, the teacher indeed states that they learned about this interest in Doctor Who that was not previously known. Second, the teacher suggests that the other students did not know about each other's interest until they got together through their badging work.

Thus, the teachers participating in the badging system were able to gain a more holistic view of students. By seeing students' interests, strengths, as well as challenges that exist outside

of the typical school-based, teacher-student interactions, the teachers were possibly able to see the students more as they really are.

5.4.5 Collegial interactions

There was some evidence of teacher collaboration related to their work on the badging system. Six of the eleven teachers referred to the monthly meetings as settings where they have an opportunity to work with and talk to their colleagues about badging. However, only two of the teachers talked about working directly with their badging partner.

When the teachers did talk about meeting and working together, they mentioned that the meetings were centered around problems or issues that the teachers were facing. When probed, concrete examples were not provided by many of the teachers except for technological problems that come up as the students shared their work through Voicethread. One teacher stated, "Not everybody likes technology as much as Ms. L. and I do."

However, three of the eleven teachers stated that they do not talk with other colleagues about the badging work. While this may be surprising considering the built in structure of the badging system with monthly meetings and paired worked arrangements for allocating and supporting each badge, teachers discussed that rather than facilitating the badging process together, they found ways to carry out their joint work separately. One teacher mentioned,

> "I'm doing the collaboration badge along with Ms. F. We do it together. Pretty much, I review and comment. I don't typically meet individually with students. Usually, Ms. F. takes care of that because of scheduling issues."

Another teacher spoke about how his partner teacher usually responds to students' work before he gets a chance to. He said,

> "…like I said, usually, she gets to it before I have an—honestly, before I have an opportunity to really say anything, and the kid's already changed something according to what she's stated. If there was that time for us to sit down together, and that planned time for us to sit down and look at those kids, I think that that would happen, that conversation of us. Wow, can you really see—and then it'd even be more celebrated, I think, what the kids are doing, if we had that opportunity built in."

The teacher makes two relevant points in this quote. First, he states that because the feedback on student work is done online—students presented their work via the web-based program, Voicethread—he and his partner teacher do not have to be in the same place or even work together to give feedback. Second, the teacher notes that the partner badging time is not built into his schedule.

Unlike the monthly faculty badge meeting, the work that teachers engaged in to support particular badges needed to be carved out of their schedules. As this teacher mentions, "I hate to say it, but honestly, if there's not time scheduled for it, something else is gonna take the place of it." Or put more directly by another teacher, "It's just something else that we're trying to fit into our ridiculously overscheduled day." Timing was identified as a barrier for implementation overall by the principal both because it was an added responsibility for teachers and because there were so many teachers at the school that were not full-time.

5.4.6 Impact on instruction

My analyses revealed that five teachers stated that the badging system had not had an impact on their instruction. An additional interviewee also stated this to be the case for her, but she was a counselor working on the badging project and instruction is not a typical work activity for her. Of the teachers who did claim that their instruction was influenced by elements of the badging system, their responses related to using new information they had gleaned about students. In addition, some teachers mentioned how the badging system could impact their instruction, but as of yet, had not.

When teachers talked about learning new things about students, they noted that they were able to draw on that new information to support instruction or provide assistance to students' learning and development. For example, one teacher said,

> "One of them is also a reluctant reader, so I found this weekend that there is a graphic novel version of the Dalek Project and have suggested that maybe, even though he thinks all books are inherently bad, he ought to go look at this graphic novel put out—but again, all of this came up because of badging. I'm like, okay. Now I know these other things about you, so I know to find a biography of Steven Jobs. I know to look for things about Doctor Who."

This teacher had stated that she learned about her badging students' interests through both their engagement in badges as well as the opportunities she had to talk with the students. While she may have been a teacher who sought out resources based on her students' interests, she claimed that the badging system provided her with additional information to support her students—in this case, it was selecting books that might align with the students' interests.

Similarly, another teacher talked about knowing students who are good with technology based on her observations of their work on badges. She said,

> "There's times where I'm having a technical problem in my classroom and I'll be like, does anyone know how to solve this? There's a lot of times where the more technologically literate kids can step up and be like, oh, yeah. Here's how you do it. They're teaching me. Being aware of the kids who have those strengths helps me to learn and grow. They love it because, obviously, they're getting recognition for something that they're really good at and like, oh, cool."

In this example, the teacher is noting that she is able to call upon students with technological know-how to support the work in the classroom. She also notes that it is a way that she can recognize the students' strengths within the flow of work in the classroom.

While these brief examples give a glimpse of how the badging system influenced instruction in a limited way, it is worth noting that two teachers suggested how the badging system might impact instructional practice in the future.

One of the teachers mentioned that he would like to see badges as being part of his mathematics class. He said,

> "We're still not there, and it's—it should be there where part of earning a badge is—it'd be nice if the—almost instead of taking a test and getting an A on it, what if it was—what if your math class was badge-centered? What if you did earn your graphing badge or something like that?"

This quote was in response to asking him about the badging system having an impact on his instructional practice. He is noting that it could have an impact and could, in fact, take the place of some of their traditional assessment practices. However, he notes that the teachers and the school are "…still not there."

The guidance counselor, also pointed out how she hopes that the badging system could impact the way students are supported instructionally. She spoke about how there are students who do not qualify for the gifted program because they do not meet the achievement requirements of their school's program. However, she said,

> "We're not gonna recommend them for a gifted program if they don't meet the basic standards. I'd like to find other ways for those kids who we know would be eligible for enrichment if they actually did their basic work in class, to find ways for them to get more involved with this."

Here, the guidance counselor is speaking about students not meeting the basic standards and she wants to get students involved in the badging system as a way to support students. She views the badging system as a tool that she and teachers could draw on to engage students that may not be typically engaged.

5.5 DISCUSSION

These findings highlight the potential and opportunities of many reform efforts that have taken place in schools. As an ongoing intervention, the school-based badging system, at this point,

represents the perspective of "What could work" rather than "What works" (Roschelle, Tatar & Kaput, 2008).

The data suggest that badging systems could serve to provide additional information about students to teachers. This holds several implications. First, this potentially extends the role and purpose of badging within learning environments beyond the ways in which badges are typically directed toward the learner or the badge earner (Bowen & Thomas, 2014; Hickey et al., 2013).

Second, as badging systems collect and store data through student work and interactions with teachers, they could potentially facilitate data-informed instruction. In addition, the categories of student data could hold added value since categories such as students' interests have not typically been considered part of the corpus of data in the data-driven instruction literature (e.g. Knapp, Copland & Swinnerton, 2007; Marsh, 2013). It is worth noting that the badging system echoes points from the literature on formative assessment (Wiliam, 2006; Shute & Kim, 2014), in that the data available to teachers through the badging system occurred through the flow of work and was not necessarily housed within a data system. An opportunity for the future may be to integrate the badging system with other data systems that a school is using. Interoperability of data systems has been a significant goal of school improvement efforts (Collins & Fruth, 2007; Fox, Schaffhauser, Fletcher, & Levin, 2013).

However, it is not clear what the implications of this new student information are for teachers' instruction. While some of the data suggested that there were instructional implications for these data, such as the example of the teacher leveraging students' interests to guide her selection of books for students to read, it is not clear if this support was useful for the students' learning and development. Future research may investigate a variety of instructional courses of

action based on different categories of data gained. This link of teachers' sense-making about data and productive instructional consequences of data has been identified by other researchers as significant for supporting the effective use of student data (Mandinach, 2012; Mandinach & Gummer, 2012; Moss, 2014).

This study also provides little evidence that the badging system facilitated collaboration or collegiality among the participating teachers. Previous research has documented how teacher collaboration is difficult to facilitate (McLaughlin & Talbert, 2001; McLaughlin & Talbert, 2006; Vescio, Ross, & Adams, 2008). This challenge is no doubt linked, at least in part, to the time that teachers have or do not have to meet with colleagues and complete joint work (Collinson & Cook, 2001). Teachers' comments from this study suggest that the lack of set-aside time was an inhibiting factor for their collaborative work. This is consequential both for the formal interactions that take place during the planned meetings as well as the informal interactions that also support teacher professional learning (Penuel, Sun, Frank, & Gallagher, 2012).

In addition to the constraint of teachers' time, the badging system did not exhibit structured supports to facilitate teacher collaboration. Once teachers are brought together, prior research suggests that the actual joint work must be facilitated (Wood, 2010). As the field has learned from teacher protocols (McDonald et al., 2013), lesson study (Lewis, Perry & Murata, 2006), and teacher work circles (Shrader et al., 2001), teachers need guidance in order to engage in meaningful collaboration. This is similar to extensive findings from computer supported collaborative learning that suggests the scaffolding of scripts to establish norms of language, group behaviors and individual roles (Dillenbourg, 2006; Stahl, 2006). In other words, scripts

can establish the logistics of learners' joint work and take the burden of coordination away from the learners (Scanlon, Anastopoulou, Kerawalla, & Mulholland, 2011; Weinberger, 2011).

Since de-privatizing instructional practice can be a significant mediating factor for innovations in schools (Little, 2002; Bryk & Schneider, 2002), future efforts of school-based badging systems may wish to consider the social infrastructure supporting the system. As other school-based badging systems may rely on teachers as facilitators and brokers for badges, future research may need to attend to the ways in which teachers work together to implement the system.

Finally, there was little evidence of teachers' participation influencing their instruction. There was some evidence of teachers using new information they learned about for instruction. As noted above, using student data for instruction has been identified as a challenge for teachers, a competency that needs to be practiced and developed (Mandinach, 2013). As badges potentially offer teachers new perspectives of students, different trajectories of youth may be pursued through a line of research.

However, as stated earlier, it may be the case that the teachers interviewed were not aware of smaller changes to instruction. Teachers might have been able to tell through interviews if they had decided to use their own self-created badges in their classroom based on their experience with the badging system. Yet, the teachers might have been unable to describe smaller changes in instruction or changes that happened sporadically. To investigate the badging systems impact on instruction at a smaller level of change, future research could employ a strategy for ongoing teachers' perception data, such as teacher logs (Rowan & Correnti, 2009). By having teachers reflect on their instruction on a regular basis throughout the course of the school year, their responses may reveal smaller, incremental changes to instruction.

Other elements of the badging system, such as the use of technology, rubrics or the badges themselves did not seem to influence teachers' practice except in an aspirational sense. Prior research suggests that teacher learning from innovations can lead to shifts in knowledge, beliefs and emotions that may or may not precede shifts in instructional practice (Bakkenes, Vermunt, & Wubbels, 2008). Therefore, it may be too early to look for impacts on instructional practice. Instead, a future study of a school based badging system may choose to examine teachers' changes in knowledge, beliefs and / or emotions due to their involvement in badges.

It is worth pointing out that there are limitations to the findings from this study. This study focused only one school. Therefore, additional research will be necessary to establish how representative this school site is with respect to the implementation of a badging system and where meaningful variability lays. Similarly, because the badging system is only in its second full year of implementation and the school is relatively small, the amount of students each teacher involved had to support is small. It is not clear if the intensity of student interactions increased, if teachers would be more likely to collaborate or if there instructional practice would be more influenced.

In addition, while teacher interviews are a meaningful method of pursuing teachers' perceptions of their successes and challenges with respect to various programs (e.g. Desimone, 2011), it is possible that the teachers do not provide a clearly catalogued inventory of their collaborative moments with colleagues, their instructional practice, or new categories of student data made available through their work in the badging system. Additional studies of teacher meetings and teacher practice could potentially identify more nuanced elements of their badging-related practices.

6.0 CONCLUDING CHAPTER

In this final chapter, I shall connect the two studies in two ways. First, I will suggest some of the design considerations from this study to inform the designs of future badging systems. As design principles can serve as laws that organize the structure of design (Buchanan, 1992), design considerations can serve as guideposts for design in an empirically untested area (Russell et al, 2013). These design considerations will come from both the findings of both studies. In addition, an initial goal of this work was to generate hypotheses for badging system use and development. I will present several hypotheses that may be useful for guiding additional research on the role of badges within learning environments.

Together, these two studies present some useful findings for the field interested in the research and development of badging systems, especially in formal school environments. For example, it is not enough to say that badging systems are motivating or not for learners as they decide whether or not to engage in the badging process. As the first study suggests, the badge system provides different signals to students that they may or may not find motivating. The badging system was engaging to students because they perceived that earning a badge was related to a longer-term goal. Some students sought to earn in a badge because it was a novel experience and some sought to earn a badge because they perceived of the experience as fun. Finally, some sought to earn a badge because of the benefits or rewards that were associated with

earning the badge such as public recognition of their accomplishment and some celebratory event, like visiting the local Google offices.

With regard to the teachers' work related to the badging system, these data suggest that the badging system afforded teachers with new information about students that was not typically available to them based their typical interactions with students. While these data suggest that the badging system may have facilitated new teacher-student relationships, these data do not suggest that the teachers' participation in the badging system had an influence on the teachers' instructional practice. Moreover, despite the new social arrangements created to support the implementation of the badging systems—pairing teachers together to facilitate a particular badge and monthly meetings for the teachers involved in the badging system, there is little evidence that these new arrangements influenced the extent to which the teachers engaged in collaborative work with their colleagues.

6.1 DESIGN CONSIDERATIONS

The following are some design considerations that may guide the design and implementation of future school-based badging systems. Design considerations can serve guideposts for the design and development of a system or program. While not prescribing design parameters, design considerations can suggest implementation in the spirit of the intended program and avoid the "replica trap," (Wiske & Perkins, 2005), the misleading approach of trying to duplicate what has worked in some location without taking into account the variations in local contexts and demands. These considerations are provided in the form of a question.

6.1.1 What are the designer's explicit assumptions about badge earners' motivations for earning a badge?

Motivating learners is one of the prevalent reasons for adding badges to learning environments. While it may not be important for a badging system designer to state their theoretical perspective that is guiding their assumptions as to why a learner would participate in the system, the designer could be explicit about the motivational assumptions that go into the design of the badging system. By documenting, the assumptions about badge earners' motivations for earning a badge, there may be several potential benefits for the design, research and evaluation of the badging systems. First, documenting the rationale for design decisions—including the assumptions of users' use and behaviors related to a design—can aid in the cumulative improvements of designs (Fischer et al, 1991; Moran & Carroll, 1996; Lee, 1997).

Second, making explicit the motivational assumptions of a badging system afford an opportunity to evaluate the system based on what it ostensibly intends to do. If the badging system is created to provide chances for learners to make personal connections to the badge and the badge-related activities, the system can be assessed based on this intention.

6.1.2 What is the social infrastructure to support the implementation of the badging system?

As stated in the previous chapter, prior research suggests that social supports can facilitate the implementation of reform efforts (e.g. Stoll et al, 2006). It is not enough to bring teachers together for a monthly meeting or partnering teachers for badges. While these structures may be productive first steps, the data from this study suggest that more supports may be needed to

support the collaboration and sharing of teachers in their badging work. This may include coupling the teacher meetings with some other mechanism for collaboration, such as lesson study (Lewis et al, 2006), tuning protocols (Blythe, Allen & Powell, 2008), or teacher work circles (Kwon, Wardrip, & Gomez, 2014).

6.1.3 What are the intended models of use for the badging system?

Similar to what the field has learned from implementing project-based learning in schools, the demands on students and teachers can be foreign to what they know and expect from school-based learning experiences (e.g. Barron et al, 1996). Therefore, specifying not only the design rationale mentioned above, particular practices for carrying out the work in the badging system could serve to guide the users. This notion dovetails with idea of specifying goals and teaching practices to support the teachers' use of curriculum materials (Ball & Cohen, 1996). By making some intended practices explicit as well as why these practices may be important, the users of the system, the teachers and students, can more realistically realize the potential of the badging system.

While the aforementioned design principles lend themselves to lines of future research, these two studies have generated some hypotheses that could further the field's understanding of how badging systems can support student learning and development in school systems through design-based interventions. For example, making clear to teachers that the badging system can serve as a source of actionable information for teachers, teachers can shape students' learning experiences based on that information. To this point, the school-based badging system was not viewed as a tool for teachers to obtain student information for instruction. Therefore, with iterative attention to student information and instructional courses of action, participating

teachers can shape their instruction based on what they have learned about students. The data in this study serve as an existence proof of the opportunity that the badging system provides for the teachers and iteratively concentrating on that could refine this perspective.

Based on the students' decisions and motivations to participate in the badging system, badge related hypotheses can be developed related to different dimensions of student motivation. For example, we might hypothesize that broader opportunities for students to make a personal connection to their badging participation may garner more student participation in the badges. Specifically, one might imagine that by enabling students to personalize a badge, this may afford an opportunity for students to see the badge as an expression of their own identity. At the school, the badges were given names based on accomplished historical and contemporary Jewish figures. The communication badge is the Steven Spielberg Communication Badge. However, we might hypothesize that enabling students add their own choice of name—even if it is another famous Jewish filmmaker (Woody Allen, Stanley Kubrick , etc.) may increase their participation. As a larger point, based on the different dimensions that students claimed to be important to their participation in the badging system, we can design and accentuate those elements in the system.

Finally, one final hypothesis is related to the extent to which the badging work is integrated into classroom work. This is similar to the previous point of accentuating an element of the badging system to influence students' interest and motivation related to their participation in the badging system. However, one might hypothesize that integrating some of the badging work may have more than just an influence on students' interest and motivation. This might be accomplished by having students earning a badge through classroom work. For example, if earning a badge became part of a classroom assignment, then it enters the instructional core and may put more of a press on instructional practice. Moreover, students' earning a badge as part of

a classroom project may provide teachers within common content areas and / or common grade level teams some substance about which to talk. While classroom-based badging work may support changes to instructional practice and potentially support teacher collaboration, it may also be negatively correlated with aspects of students' interest and motivation, such as their sense of agency or personal connections they make to the badging system.

6.2 ADDITIONAL FUTURE RESEARCH

The aforementioned design considerations and hypothetical approaches serve as starting points for future research and design, there are a couple other areas for future research and development that are worth mentioning. First, Bielaczyc (2013) argues that design-based research ought to focus attention on the "problems of practical implementation" as an important step between the establishment of existence proofs and scaling up of an innovation. She argues that this includes understanding how designs for social infrastructure support the implementation of a learning activity. The data from these badging studies suggest that understanding the implementation paths (Collins, Joseph & Bielaczyc, 2004; Bielaczyc, 2006) may be significant for effective implementation of school-based badging systems (or other place-based badging systems for that matter).

The implementation path of a badging system includes many of the issues that surfaced from these studies. For example, from the perspective of students' motivations to participate in a badging system, implementation may need to enable badges to have some currency that enables students to meet longer term goals such as entering a desirable high school or college, Furthermore, if teachers are facilitating the badge-earning process, for example, by assessing

students' work against a rubric, or coaching their process along a specific project, learning opportunities may need to be created to teachers' capable execution of the demands of the badge system.

An additional line of study worth pursuing is specifically related to this school-based implementation of a badging system is to analyze the implementation with respect to the Fishman et al cube of implementation. As I mentioned previously, the school site may not be representative of many schools in the United States. However, investigating the extent to which the school is meeting the implementation needs of capacity, policies and culture to support the badging system may inform other implementations that may happen in other school districts.

In general, theses studies suggest that more research is needed with respect to badges and also suggests some directions for research. And ultimately, research will have to investigate the relationship between badging in learning environments and student achievement, if the badges are to exist within formal school settings. At this point, this program is still in development and we can learn from their successes and challenges. As the principal said, "I think what was successful is that some kids stuck with it. " As the school, and other schools have more students "sticking with it" and earning badges, we can not only understand why they participate, but also how teachers can productively support students' earning of badges and how that influences outcomes that the school cares about.

APPENDIX A

RUBRIC FOR BRIN INFORMATION LITERACY BADGE

	Exemplary Performance	**Proficient Performance**	**Partially Proficient Performance**	**Poor Performance**
Recognize It Phase	Clearly and consistently recognizes the skill when it is enacted. Can accurately differentiate between high and low skill levels and between this and other skills.	Often recognizes the skill when it is enacted. Occasionally differentiates between high and low skill levels.	Sometimes recognizes the skill when it is enacted. Occasionally differentiates between high and low skill levels.	Does not recognize the skill when it is enacted. Cannot differentiate between high and low skill levels.
Talk About It Phase	Accurately talks about the skill. Can state multiple examples of when it is enacted. Articulates importance or value of the skill.	Accurately talks about the skill. Can state examples of when it is enacted.	Can talk about the skill in a basic way, sometimes inaccurately. Provides weak examples of when it is enacted.	Cannot talk about or abstract the skill. Fails to state examples of when it is enacted.
Do It Phase	Clearly identifies what information is needed to address research questions.	Identifies most of the information needed to address research questions. Uses and	Identifies few of the pieces of information needed to address research questions.	Fails to identify what information is needed to address research questions, Uses

	Intentionally uses and modifies search strategies that yield relevant information. Evaluates quality of sources for credibility and effectively selects credible sources. Gathers sources and information highly pertinent to research questions. Creatively designs an original product organizing and presenting information from multiple sources. Synthesizes content from multiple sources to make larger arguments.	sometimes modifies search strategies that yield somewhat relevant information. Sometimes evaluates quality of sources for credibility and somewhat effectively selects credible sources. Gathers sources and information mostly pertinent to research questions. Designs a product organizing and presenting information adequately. Synthesizes multiple sources to support argument.	Uses search strategies that yield little relevant information. Rarely evaluates the quality of sources and does not effectively select credible sources. Gathers sources and information with little relevance to research questions. Designs a basic product that poorly conveys content. Rarely integrates multiple sources into argument.	search strategies that yield no relevant information, Never evaluates the quality of sources and often uses inaccurate sources, Gathers sources that are irrelevant to research questions, Copies or relies on others for product design, merely repeats information provided; denies evidence without adequate justification, fails to communicate content accurately or effectively.

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